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ABSTRACT

Hearings were held on the Technology for Education Act of 1993 (S. 1040) to support systemic improvement of education and the development of a technologically literate citizenry and internationally competitive work force by establishing a comprehensive system through which appropriate technology-enhanced curriculum, instruction, and administrative support resources and services that support the national education goals and any national education standards that may be developed, are provided to schools throughout the United States. comprehensive way, the Act addresses issues related to the use of technology in education and gives it the high priority it deserves in educational planning. At the July hearings in Washington, a panel of educators focused on classroom success through technology, explaining what technology has done for them and providing eyewitness accounts of how technology opens opportunities for learning. A second panel of teachers and students provided hands-on demonstrations of some things that are currently available for classroom use. At the August hearings in Albuquerque, the same approach was used, with an introductory panel of educators and a second panel of teachers and students providing demonstrations. The bill provides a vision and strategy for technology at the federal level, with funding for equipment, teacher training, technical support, and incentives to develop the market for educational technology products. Prepared statements and supplemental material complement the statements of the more than 18 educators and students. (SLD)

IR

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TECHNOLOGY FOR EDUCATION ACT OF 1993

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
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HEARINGS

BEFORE THE

COMMITTEE ON LABOR AND HUMAN RESOURCES UNITED STATES SENATE

ONE HUNDRED THIRD CONGRESS

FIRST SESSION

ON

S. 1040

TO SUPPORT SYSTEMIC IMPROVEMENT OF EDUCATION AND THE DEVELOPMENT OF A TECHNOLOGICALLY LITERATE CITIZENRY AND INTERNATIONALLY COMPETITIVE WORK FORCE BY ESTABLISHING A COMPREHENSIVE SYSTEM THROUGH WHICH APPROPRIATE TECHNOLOGY-ENHANCED CURRICULUM, INSTRUCTION, AND ADMINISTRATIVE SUPPORT RESOURCES AND SERVICES, THAT SUPPORT THE NATIONAL EDUCATION GOALS AND ANY NATIONAL EDUCATION STANDARDS THAT MAY BE DEVELOPED, ARE PROVIDED TO SCHOOLS THROUGHOUT THE UNITED STATES

JULY 21, 1993 WASHINGTON, DC

AUGUST 18, 1993 ALBUQUERQUE, NM

Printed for the use of the Committee on Labor and Human Resources

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TECHNOLOGY FOR EDUCATION ACT OF 1993

WEDNESDAY, JULY 21, 1993

U.S. SENATE,
COMMITTEE ON LABOR AND HUMAN RESOURCES,
Washington, DC.

The committee met, pursuant to notice, at 10:00 a.m., in room SD–430, Dirksen Senate Office Building, Senator Bingaman, presiding.

Present: Senators Kennedy, Bingaman, and Jeffords.

Senator BINGAMAN [presiding.] The hearing will come to order.

I am in the unusual position of chairing a hearing in Senator Kennedy's committee here because he has to leave very shortly, so before I even give an opening statement, let me call on Senator Kennedy to make his statement, because he does have the U.S. Supreme Court nominee hearing going on at the same time.

Senator Kennedy.

OPENING STATEMENT OF SENATOR KENNEDY

The CHAIRMAN. Thank you very much, Mr. Chairman.

At the outset of this hearing, I want to pay tribute to Jeff Bingaman for the leadership that he has been providing in the areas of technology and education, and understanding the importance of a comprehensive approach to this issue. We are working very closely together, and I think this is one of the real priority pieces of legislation for this committee and, most important, for the country.

We want to express our appreciation to all of the witnesses who are here this morning. We have a very varied group of witnesses, including some young students who will put on a presentation for us, and I am grateful to all of them for being here. We want to give them the assurance that Senator Bingaman and I have been meeting with Secretary Riley and Madeleine Kunin, as well as representatives at the White House about the importance of this legislation. We are working with members of the commerce Committee, who have some different technology issues that are moving along. But we want to give them our assurance that this is something of great importance to Senator Bingaman and myself, as well as the other members of the committee, and we value very highly the comments and the testimony that will be given today.

I'll just take a moment, and I apologize to the witnesses for not being able to be here, particularly to Annemarie Ryan, from Massachusetts, a teacher at Charlestown High School. Given the level of interest in Boston and in Massachusetts generally, and the work that has been done out in the field in this area over a long period

of time, we plan to have an additional hearing up in Boston later in the session.

As Senator Bingaman mentioned, we have Judge Ginsburg, the U.S. Supreme Court nominee, in the Judiciary Committee this morning, as well as the Armed Services Committee, which both of us are members of, so we are pressed in terms of time, and we apologize.

Today we address an issue that has potential to improve classrooms throughout the country—educational technology. We talk often about world class standards and international competitiveness, but the reality is that the vast majority of pupils are trying to learn in the 1990's with technology that is out-of-date.

The schools of today cannot teach with the technology of yesterday. We have seen that particularly in our Boston schools. In few other institutions in our society do professionals have such limited access to modern technology as teachers in schools especially in our poorest districts. S. 1040 can change that.

At the hearing today, we will hear from teachers like Annemarie Ryan, who taught for many years at Charlestown High School in Massachusetts and now teaches other teachers to integrate technology in their lessons. By creative uses of technology, she has demonstrated that all children can learn and that all teachers can learn as well. It is not enough to drill children in numbers and facts, or with pencil and paper. Through technology, Annemarie and many Boston teachers have deepened their own understanding of mathematics and help one another pass that understanding on to their students. And by sharing those concepts and techniques with others, they are preparing students to think and solve problems on their own.

They are part of a movement in many parts of the country that is helping to transform the Nation's schools one by one, by creating a new climate of learning and intellectual stimulation.

The need for this bill has been amply documented. Even in wealthy districts, technology is often unavailable, or used ineffectively. In January 1992, Education Week reported that the high cost of purchasing, maintaining, and upgrading equipment, the lack of adequate software that dovetails with teacher curriculum needs, the absence of assessments that reflect the complex thinking skills and the dearth of teacher training all work against innovative use of technology in schools.

In a comprehensive way, the Technology for Education Act addresses all of these issues and gives technology the high priority it deserves in contemporary American education.

I commend Senator Bingaman for his leadership in developing and introducing this bill, and I commend Senator Cochran as well. The legislation has received impressive bipartisan support, and I look forward to today's testimony and to early action on this important bill.

I thank you, Mr. Chairman.

Senator BINGAMAN. Thank you very much.

I am sure everyone here is well aware that Senator Kennedy is the pioneer who started the STAR Schools Program and got that going. We are trying to build on that very auspicious start, and that is what the legislation is about. He was too modest in giving

me credit for developing the bill; he had a major part in that, and his staff worked very hard with my staff in the drafting of it. So I do think this is an area where we can make progress and one that the Federal Government can make a great contribution in.

So thank you very much for your statement, Senator Kennedy.

The CHAIRMAN. Thank you very much.

OPENING STATEMENT OF SENATOR BINGAMAN

Senator BINGAMAN. I will go ahead with a very short statement myself, and then we'll get on with the witnesses. As everybody can see, we have a lot of interest in this subject, and we have a great many witnesses—very good witnesses—and unfortunately, we need to finish the hearing by 12.

The hearing is focused on S. 1040, which is the Technology for Education Act of 1993. The idea of this hearing is to make other Senators and people who observe the hearing believers in the value of educational technology as a way to help with education in our country.

I am very grateful that Senator Kennedy permitted this hearing to be scheduled at this time. There is a great deal of other business going on here in the Senate, but we wanted to get this done early so we can hopefully move the legislation this year.

We have taken a slightly different tack in composing our panels this year. The goal was to really catch the imagination of people about the possibilities that technology presents in transforming the Nation's classrooms into laboratories for creative learning. We hope that there will be a real appetite for and an interest stimulated for the innovative use of technology in the schools as a result of our hearing.

We have asked our first panel to focus on classroom success through technology. In essence, they will tell firsthand what technology has done for them, and in particular circumstances, the panel of students, teachers and administrators can give eyewitness accounts of how technology has changed their lives and opened the opportunities to explore the world of learning.

Then we'll have a second panel that will focus on hands-on demonstrations of what is currently available for classroom use. Through students and teachers that we have asked to be here today, we can witness some of the exciting opportunities that are available to schools when the resources are provided.

As you will witness today, technology can make a tremendous difference in the quality of education we present to our children. S. 1040 is intended to be a vehicle for funnelling Federal support and assistance to State and local schools. The bill provides a vision and a strategy at the Federal level with funding to ease the efforts by State and local school districts to provide equipment, teacher training, technical support, as well as incentives to develop the market for educational products along the lines that are involved in the testimony today.

Let me make a couple of housekeeping announcements before we begin. We are going to accept additional written testimony from other organizations which will be sent in in the next 30 days. If people in the audience do wish to make their views known, please

send that to the committee, and we'll try to include that in the record.

Let me also just State for the witnesses—I know this has been emphasized to you before—that because of the large number of witnesses and the desire to hear from everybody, we will include everyone's written statement in the record and ask if you could summarize those statements in a few minutes. I think that will be the best way to proceed.

[The prepared statement of Senators Bingaman and Pell follow:]

PREPARED STATEMENT OF SENATOR BINGAMAN

Good morning, and welcome to today's hearing on S. 1040, the Technology for Education Act of 1993. I believe that what you will see and hear today will make you a "believer" in educational technology and motivate you, as it has me, to press for creative ways to extend these innovative programs to each and every child in America. I am grateful to the Chairman of the Senate's Committee on Labor and Human Resources, Mr. Kennedy, for sanctioning this hearing. I understand that Senator Kennedy will join us shortly.

I'm excited about today's hearing because we have taken a slightly different tack with the composition of our panels. Our goal with this hearing is to captivate your imagination to give you a taste of the endless possibilities through technology to transform our nation's classrooms—to exciting laboratories for creative learning.

We hope to peak your interest and stimulate your appetite for innovative uses of technology for our children, their parents and teachers. If we have done our job right, you will walk away from this hearing with more questions than answers—more information than you can possibly process in these two short hours!

Today's hearing should be a walk on the other side of the looking glass—leaving behind the traditional classroom in our brief journey.

We have asked our first panel to focus on classroom success through technology. In essence, they will tell you, first-hand, "what technology has done for me." Our panel of students, teachers, administrators will give eye-witness accounts of how technology has changed their lives and opened endless opportunities to explore the world of learning.

The second panel will focus on "what technology can do for you" through a hands-on demonstration of what is currently available for classroom use. Through the students and teachers we've asked here today, we will witness what exciting opportunities await our nation's schools through technology. We even have an example of how defense technology applications have been modified for classroom use.

We will see demonstrations of state of the art equipment and complementary software packages, as well as a program enabling teachers to tailor the curriculum to the swiftly changing flow of information and the individual needs of the students.

As you will witness today, creative uses of technology by skilled teachers can change our outlook on education—making teachers and students partners in the quest for knowledge and the process for learning. Our problem, however, is that too few of these examples exist in the classrooms across our Nation.

We could point the finger of blame to any number of factors; but, for whatever the reasons, our job at the federal level should be to ease the burden on the state and local schools and to provide leadership and assistance in their efforts to reach the National Education Goals by the year 2000. Providing educational technology is one of the most cost-effective means by which the Federal Government can assist States and local school districts to meet the ambitious goals.

S. 1040 provides the vehicle—the means—to funnel this support to the state and local level. The educational reform effort we, as a nation, are currently undertaking must be grounded with the goal of equity and access for all of America's school children. Our bill is, by no means, the solution to the serious problem of inequity in our school systems across America. We believe, however, that we provide the first critical step.

This bill provides a vision and strategy at the federal level, with funding to ease the effort by the State and local school districts to provide equipment, teacher training, and technical support, as well as incentives to develop the market for educational products—along the lines of what you will see here today.

I want to thank you all for your attendance, and I look forward to an excellent morning of discovery.

PREPARED STATEMENT OF SENATOR PELL

I would like to commend Senator Bingaman for his interest and leadership in this most important and intriguing area. With resources scarce, inequities present, and achievement needing improvement, technology can play a tremendous role in advancing equity and excellence in general education. and I regret I am unable to attend the hearing today.

As some of you know, in last year's Office of Educational Research and Improvement reauthorization, we provided for the creation of an Office of Educational Technology to pull together the different technology support programs currently in the Department of Education and to provide recommendations for future technology policy development. I understand this remains an area of consensus and hope the proposal will move forward.

I would be remiss, however, if I did not point out that technology is not a substitute for an enthusiastic, qualified and competent teacher. Technology in the classroom should enhance and supplement teacher instruction. Toward that end, classroom educators should be provided with significant professional development opportunities. If teachers are intimidated by technology, they are not likely to utilize it in the classroom.

A technology initiative for in-class instruction must be encompassed by careful planning, provisions for ongoing maintenance, compatibility of hardware that can be easily upgraded, and as I said, substantial staff development. This legislation does that and more. It is an important component in providing students a world-class education.

Senator BINGAMAN. I will call upon the first panel to present their testimonies, and I will withhold questions until we finish hearing from the entire panel.

Julie Stogsdill is with the Buddy System Project in Indiana and is someone I have known for many years. She had a great part in getting me elected to this job, and I appreciate that, back when she lived in New Mexico. So I appreciate her being here.

Why don't we start with you, Julie?

STATEMENTS OF JULIE STOGSDILL, PROJECT COORDINATOR, BUDDY SYSTEM PROJECT, INDIANAPOLIS, IN; ANNEMARIE RYAN, TEACHER, CHARLESTOWN HIGH SCHOOL, CHARLESTOWN, MA; LEA ANNE BRANDON AND JERRY L. KITCHINGS, HAYES COOPER CENTER FOR MATH, SCIENCE AND TECHNOLOGY, MERIGOLD, MS; GERALDINE DIRKS AND PHILIP ROYBALL, POJOAQUE HIGH SCHOOL, NM; AND VALERIE WILFORD, EXECUTIVE DIRECTOR, ILLINOIS VALLEY LIBRARY SYSTEM

Ms. STOGSDILL. I am honored to represent the Buddy System Project, the largest, and we believe the most innovative educational technology program in the United States today.

Buddy began in 1988 in five 4th grade classrooms in Indiana, and when we begin school next month, Buddy will reach 4th, 5th and 6th grade students at 50 sites in 22 Indiana school districts.

The video that you are going to see will hopefully convey the excitement and the joy of learning that we find evident throughout the Buddy System.

Senator BINGAMAN. OK, we have a video now.

[Videotape shown.]

Senator BINGAMAN. Does that complete your presentation?

Ms. STOGSDILL. Yes, that's correct.

Senator BINGAMAN. OK. We'll have some questions later.

Senator BINGAMAN. Next, we'll hear from three schools in Massachusetts, Mississippi, and New Mexico. Annemarie Ryan is a teacher from Charlestown High School in Massachusetts. Lea Anne Brandon is an information specialist, and Jerry Kitchings is the principal from Hayes Cooper Center in Mississippi, and Gerry Dirks and Philip Royball are a teacher and student team from Pojoaque High School in New Mexico.

Let's hear from Annemarie Ryan next.

Ms. RYAN. I hope you understand that as a teacher and also a restructuring coordinator for the high schools in Boston, it is very difficult for a teacher to talk for such a short period of time.

Senator BINGAMAN. Well, it is hard for people in Congress, also. [Laughter.]

Ms. RYAN. We'll try.

I am speaking to the classroom successes, and Boston has certainly led that effort for many years now. The Office of Technology in the Boston public schools has for many years tried to break down the walls of the classroom, and they have done so in four projects I'd like to briefly describe to you today.

Those four projects are changing how and what we teach. They are acronyms: TEAMS, EMMAT, Project SMART and BOSNET.

TEAMS stands for Telecommunications Education for Advances in Math and Science, which is a federally funded program through the STAR schools. It is interactive distance learning via satellite,

with L.A., originated in Los Angeles, Boston, Detroit and Washington, DC.

This program teaches students how to problem solve. There are problem solving activities. There are modules that are created for the teachers prior to the learning. So this is not just something that comes over a television and is dumped in the laps of teachers who do not know what to do with it. There is a serious effort here to train the teachers prior to each module.

It uses manipulatives, which is very important, technology, computers, and calculators. Each module is taught over 6 to 8 weeks from Los Angeles. Students have the ability to call that teacher, ask questions, or offer solutions. They work on hands-on activities, they conduct experiments, and they call in their results and actually create a community between the classmates in all of those cities and the teachers. And in fact, two of the teachers, a math and a science teacher, came from Hollywood to visit the schools in Boston, and it was like a star had walked into the room. They knew this person was on television, and they wanted his autograph and the whole thing. It made the teacher feel great. Also, they wanted to share their projects.

Each school gets a large-screen monitor, a VCR, a computer and a modem.

The next program I'd like to speak about is EMMAT, which is also federally funded through an NSF grant, and it is in about its 5th or 6th year. It stands for Elementary and Middle Math and Technology. And as I left my job in Boston yesterday, I left a large number of teachers sitting in a high school for 3 weeks, on their own time, voluntarily learning to be an EMMAT teacher. This is the 5th or 6th year, and in fact we have so many teachers who want to be trained in EMMAT that we have to turn away four times the number of teachers that apply because of funding and for other reasons.

EMMAT is now being used in 22 middle schools and 72 elementary schools. Again, it uses computers, telecommunications, manipulatives and calculators; it focuses on problem solving, higher-level thinking skills, estimation, measurement, and geometry.

The importance piece of both of these programs is that the teacher is not the lecturer at the front of the classroom, telling the students the answers. The point here is that the teacher is asking the student to solve the problem and think about how to go about it, the strategy—which is, as you know, in careers today and in the future, what our students need for skills.

The premise here is that learning is fun. And it is fun—they don't even know they are learning geometry and statistics and estimation. Kids have created a geosphere, and they have put toothpicks with gumdrops in between, and they have learned a lot of geometry by doing that.

In fact, what the teachers are finding is that as they are using telecommunication and this technology, the students are going more to textbooks because they want to find the answers in the textbooks and use them as a resource. Also, because of television, students have not been doing a great deal of writing, but with telecommunication, they are doing more writing because they are communicating with students in the same city, in the same school sys-

tem, in the same State, in the country and outside of the country. So this is a benefit. They are writing more rather than less, and they have seen the benefit of writing.

These teachers who are being trained in the EMMAT project are not just dropped off after 3 weeks. In September, once a month, they will come together for an entire day and meet, share, reflect, talk about problems, learn new things. They also have a chance to visit other classrooms. Former EMMAT teachers also meet on a regular basis, so the are just not let go.

An important thing I would like to stress is ongoing professional support and professional development. Also, the EMMAT teachers who have been through the program who have been very successful are used as trainers. We don't have to go out and hire consultants. We use the expertise that we have in our own system.

This Federal program has allowed amazing things to happen in our classrooms. Because of the time constraints, I will not comment on SMART and BOSNET, but they are both very dynamic programs that I would like to write more to you about.

I would just like to give you a few examples of what is happening in our classrooms. We have some second graders in Boston, and they wanted to put on a multicultural fair. So since they have a sister school in Bogota, Colombia, they decided to have a live, log-on telecommunications hookup at the multicultural fair. Well, it turned out to be much more interesting than they thought it would be because, as you know, they personally experience effects of "El Nino," the draught, in Colombia. And their sister school only has electricity for 3 hours a day because they are dependent on hydro-electric power. So they got a physics lesson, they got a multicultural lesson, and it took them out of their urban community into the world where they are going to have to survive.

We have had other teachers who have had their students track the amount of rain and the pH balance at their schools, so they started to compare the pH balance with other schools, and then they started to compare it with other States. Then they started to talk about acid rain, and what is happening in your State, what is happening in our State.

You can also connect a lot of the telecommunications up to community service learning, but I will not go on with that because I would go on for a long time.

One other example I will give you is that students in one of our elementary schools said to their teacher 1 day—they had been plotting the phases of the moon for a month—and they said, "It is a quarter moon today. Do you think it is a quarter moon in Japan?" So the teacher, rather than giving them the answer, said, "Well, how are you going to find out if it is a quarter moon in Japan?"

They immediately said, "We have the telecommunications. Let's do the telecommunications." But we don't have a hookup to Japan yet. So they said, "Let's send a letter to Bogota." So they sent a letter to Bogota and got a little insulting letter back saying, of course, the moon is the same size as the moon is in your area—which they were a little insulted about. But the point is that instead of giving them the answer, they had to strategize about where is the furthest distance away for us to call; how are we going to attack this problem and figure it out?

Did you graph equations when you were in high school? Do you remember how many hours that took? And what was the benefit of graphing all those dots? We can graph them on a computer now, and you can change by the click of a mouse one of those points and automatically have that graph change. So the important point is not that you had to sit there for an hour and a half plotting graphs, but that you are sitting at the computer, asking, "What if I changed this point; what would happen?" So the concept is more important than the task of sitting there and plotting graphs.

One other thing I would like to mention is administrators. We have many teachers who are very frustrated because in both of these programs, we use a great deal of manipulatives, the TEAMS and the EMMAT, which are federally funded. And some of the administrators who are not familiar with technology and what is going on come in, and they think the teachers are playing games with the students, which they are not, and they get called on the carpet for it.

I was talking to a teacher yesterday at an EMMAT meeting, and she said, "I can't wait to go back in September because I am going to tell that administrator I am not playing games. These kids are learning geometry." So our administrators need to have a little professional development here.

If you want long-term hope for the economy, students who are learning this technology are our hope, and if they don't have it, I think we are in deep trouble. What does this mean? The positive side is that technology is providing students with innovative quality programs. But what is crucial is that we need innovative teaching and staff development, and we need funding.

What is the negative side? We don't have the means to bring this to all the children in all the schools in Boston. We need professional development. Our system has not funded professional development for decades. We have not had system funding for computers for 8 years. The corporate world would not get along with the kind of obsolescent hardware that we are beginning to have because we have had it so long; they would not get away with no staff development or training. Our bottom line is more important; it is the children who are coming up for the future.

May I say one more thing?

Senator BINGAMAN. Sure.

Ms. RYAN. The positive side for the students is that this increases teamwork and cooperative learning; individualized learning if the student is below level. So it is nonjudgmental; you don't get a red mark on the computer. The computer may tell you that you have made a mistake, but that doesn't mean your self-esteem is going to be lessened. It is an equalizer.

We have students in our schools who cannot take calculus because there are not enough students to hire a teacher. If we have long-distance learning in our system to teach it to many of our high schools, we could do that. It gives students a chance to have hands-on learning, and it encourages writing skills. Also, it promotes cultural understanding because of the pairing and the teamwork and the understanding of individual learning styles.

You first have to reach the teachers and do the staff development. And in the past, what has happened is that a computer gets

put in a classroom, and many teachers don't want to have anything to do with it; they are afraid of the technology because they have not grown up with it.

The other problem is when teachers do get training, and then they don't have access. They get back to the schools, and they give up because they don't have access to computers.

I give you an open invitation to Boston. Come and see our students who are sitting at recess at computers and at distance learning. Come and see our students who won't go home, and you can't push them out the door; you have to literally drag them out.

Teachers have revised their expectations of even troubled students because when they use the technology, it turns those students on, and the teachers see them in a whole different light and all of a sudden find out that that student does have potential.

Again, I would like to in the future write to you and talk to you more about the hardware obsolescence problem.

Senator BINGAMAN. Thank you very much. I appreciate that excellent testimony.

Next, Lea Anne Brandon, who is an information specialist, and Jerry Kitchings, a principal from Hayes Cooper Center in Mississippi.

Let me say also that Senator Cochran is my partner in this legislation, so he has a particular interest in your success story. So please go right ahead.

Ms. BRANDON. Thank you.

We come with some documented proof, but we are also living and breathing examples that technology really can make a dramatic difference in the lives of our children, and that is because we see it happen every, single day.

Two years ago, our community came together and decided that we could no longer afford to do school the way we have been doing school, that our children deserved more, especially if they were going to have to live and compete and succeed in the 21st century. We got a consensus of the community, and they decided that technology would be the answer. It has developed into our vision.

The community sought and won a $1.3 million grant from the Magnet School Assistance Program. That has enabled us to put state-of-the-art technology in computers and other teaching tools in the hands of our teachers and students at this school. Without this financial assistance, there is no way that our children could be learning and succeeding at the level they are today.

We would love to invite you to step inside this small, 2-year-old school. You won't hear any bells ringing to signal the end of a regimented class period, and you will not see desks lined up neatly in a row, with a bored teacher standing in front of a board classroom, lecturing from a textbook.

What you will see is 190 excited students who learning to explore, to imagine and to create in ways that their parents and their grandparents and that I never imagined possible for my child. They are exploring and thinking and learning by doing and by seeing.

You will see at least eight computers in every, single classroom. You will see a 28-computer station in the lab where students go in and not only do activities in math and science and reading and

writing, but where they create their own works using multimedia tools that I never dreamed imaginable.

And in every classroom, you'll see a teacher who is energized, who has been given back her classroom, and has been allowed to be a professional, to not just disseminate facts and figures to the children and expect them to absorb them like sponges, but this is a person who is in charge, who is a "manager of learning," that enables children to find their own answers instead of expecting rote memorization.

Computers are their tools. They are very important teaching tools.

I guess the bottom line is that at the Hayes Cooper Center, we have taken 190 students from every background imaginable—it is a 50 percent black, 50 percent white enrollment. We have students from below poverty level whose homes have just now gotten electricity and running water, unfortunately; we also have children from two-paycheck professional university families. But the expectation is the same for every child, and that's not just lip service.

What we have found is that by giving these children the tools, raising their expectations and giving them what they need to reach those expectations, they are learning and they are achieving.

We say—and it is not just a phrase—that our children are learning not just to answer questions, but they are questioning the answers that they find. We are not just giving them an opportunity to ask us why, but they are asking why not. And then we are giving them the tools that they need to go out and discover their own answers.

It is exciting. I have never seen anything like it in my life.

Thank you.

Senator BINGAMAN. Thank you very much.

Dr. Kitchings, did you wish to add some comments?

Mr. KITCHINGS. Just a few comments. I could say "ditto" to the previous two testimonies here.

We at Hayes Cooper began 2 years ago with a magnet school grant. We are 50 percent minority, 50 percent nonminority at the school. The summer before we opened our teachers received 2 weeks of intensive training in hardware and software applications. During the past few years, they received an additional 75 hours of training on software applications and methods to incorporate these into the classroom, which is very, very important to us that they stay abreast of the latest technologies available for our children.

As a result of this training, our teachers incorporate technology and software throughout the curriculum in math, science, social studies—the whole spectrum of courseware.

Our classrooms are networked so that all kids have access to all software that we have at the Hayes Cooper School. For instance, if a 3rd grade child needs some help in a 1st grade skill, he has that capability in his classroom. Conversely, if a 5th grade student needs more practice on a skill that is a 3rd grade skill, he can also get that.

In our computer lab, we have all the software, but it is a different kind of software, because we want our kids to see different presentation methods when they go to the lab as opposed to the classroom. They do the same kinds of things in the classroom, but

what is unique is that the teacher and the lab teacher can get together and program the computer so when Johnny comes to the lab, Johnny only gets what he needs to get. It is not to play games, and it is not to let Johnny decide what he wants to do.

So with these two combinations, we have been very, very successful at the Hayes Cooper School. We have given the Stanford Achievement Test for the past 2 years at Hayes Cooper. The first year, our kids scored at the 76th percentile nationally. This past April, they scored at the 80th percentile nationally, and we were very, very pleased with that. But the most impressive score of all that we have at Hayes Cooper—and I don't have those number with me today—is that the gap of achievement between minority and nonminority students is narrowing substantially as compared to the gap between minority and nonminority students in the district as a whole. We feel very, very good about that. We know our kids are achieving, and we know that all of our children are achieving. We would like for each child to be successful every day.

I would like to compliment the committee on is consideration of Senate bill 1040. I think if it passes and becomes law, it will provide much needed resources for all the boys and girls of our Nation.

We have been overly blessed at Hayes Cooper School, and I wish the same for other schools throughout the United States.

Thank you.

[The prepared statement of Ms. Brandon and Mr. Kitchings follow:]

PREPARED STATEMENT OF MS. BRANDON AND MR. KITCHINGS

Jay Brandon hasn't yet lost his two front teeth but he can tell you, without hesitation, about the life cycle of a meal worm and exactly how that off-white larva reacts to light, heat, water and odor.

He knows because he's watched the worm hatch from an egg, measured it and charted its growth and conducted experiments with it as a larva, observed it throughout the pupa stage and celebrated like a proud father when it matured into a shiny, black adult beetle.

He can carry on a conversation in Spanish and he's already written and published his first book -- about a trip to Disneyworld when he visited Space Mountain, the Haunted Mansion and the Country Bear Jamboree.

He does his homework at night under the watchful eye of his parents and wakes in the morning eager to return to a school that's nothing like the ones his parents attended or ever dreamed existed.

He's buoyed by a self-confidence that assures him that he is special just because he is who he is. He learns by doing -- not just by seeing or hearing. He encourages his classmates when they're having difficulty catching onto a new idea. And the next day, he learns from those same peers when he's the one having trouble keeping up.

He's learning to ask "Why?" -- and "Why not?" He's discovering where to find his own answers instead of just turning to the nearest adult and expecting someone to spoon-feed him the information.

He's reading and writing and computing and problem-solving and creating -- all with the help of the latest technology and computer instruction and with the assistance of a caring, nurturing team of teachers.

And, in all of this, he is no different from the 27 other second graders studying and learning daily at The Hayes Cooper Center for Math, Science & Technology in tiny, rural Merigold, Mississippi.

They -- and the entire 190 student enrollment at the bright, fresh, two-year-old school that's housed in an old, refurbished, non-descript 32-year-old building -- are learning more, probing deeper and thinking more creatively than any other building full of elementary students around. And they are doing all of this smack in the middle of the dirt-poor Mississippi Delta surrounded by seemingly endless cotton and rice fields, a honky-tonk juke joint and rows of ramshackle homes.

They are learning to find solutions instead of collecting excuses. They are exploring the possibilities -- all the possibilities.

Their mentors have worked harder and longer and closer together than teachers and administrators have ever done before and they have found a new way of doing school that first raises expectations for every child and then gives every one of those students the tools and the tutoring necessary to reach very real, very personal, very ambitious goals.

And they are succeeding.

BACKGROUND

In the fall of 1990, Cleveland School District officials called together parents, teachers, principals and businesspeople and gave them a large, blank sheet of paper.

Their instructions: design a school where learning happens like never before.

They were told to ignore preconceived notions about what schools were "supposed to be like" and, for at least the time being, disregard what such a program might cost to implement.

They were handed the backing of the Cleveland Schools Board of Trustees and offered all the technical assistance they might need in their creative endeavors.

The result: The Hayes Cooper Center for Math, Science & Technology.

It's a two-year-old elementary school where every student is learning to speak a foreign language and understand a different culture; is computer literate; is exploring the worlds of science by getting their hands dirty and observing the world just outside their classroom door and experimenting with ideas that they previously only read about in textbooks; and is making mathematics a practical part of their everyday life with understandable applications and hands-on manipulatives.

BEST COPY AVAILABLE

It's a technology-infused learning center where the future is clearly within sight.

It's a school where learning is a lifelong experience, where parents are active participants and resource persons for not only their own children but for the enrollment at large and where mothers and fathers and guardians commit, in writing, to supporting their child's education by making learning a priority at home, reading with their child and monitoring their homework, classwork, test scores and special projects.

It's the focus of widespread community support where businesses not only donate their money, but commit time and personnel to bring the real world into the classroom -- and take the classroom into local industry and business and government settings.

It's a whole new way of doing school.

The Hayes Cooper Center for Math, Science and Technology in Merigold, Mississippi, seeks to provide quality educational options for students by offering them a Kindergarten through Grade 6 (and this fall expanding to Grade 8) academic program that defies traditional descriptions of an elementary school. The ever-evolving program combines the best of traditional teaching methods with innovative uses of computers integrated into every subject area. Science and math are taught by doing as teachers give students hands-on opportunities to explore the worlds of science through experimentation, observation and evaluation. Math is made real through manipulatives and concrete, practical applications brought into the classroom via technology.

The Center seeks to erase statistical differences in grade level achievement and standardized test scores among black and white students -- a problem that has long plagued the underprivileged minority school districts of the Mississippi Delta -- by offering every student an individualized educational program tailored to meet his/her learning style and academic needs. During its first year of operation, the Center was able to improve nationally normed standardized test scores across all grade levels and made significant strides in narrowing the gap in performance among students of different racial groups to the point where racial minorities can no longer be identified by test outcomes. At Hayes Cooper, this is accomplished through daily, sustained use of computers and hands-on learning experiences where children learn by doing under the direction and guidance of a cooperative teaching team.

High expectations are institutionalized. Instruction is individualized.

Goals of the Hayes Cooper Center envelop and expand upon the Cleveland School District's aim that every student will progress academically every day. The Center brings students of different social, economic, racial and ethnic background together in an educational setting that is beneficial to all students. Further, it expects students to meet and exceed the educational attainment of students in other schools in Cleveland, the Delta, the state, the nation, and -- eventually -- the world.

There is no glass ceiling.

Further, the Hayes Cooper Center seeks to eliminate minority isolation at the elementary school level by maintaining a 50/50 racial composition. Cultural diversity is celebrated as the individual's unique background, interests, goals and desires are emphasized.

The Center now serves 190 students drawn from every corner of the Cleveland School District, irrespective of their neighborhood school zone, with plans to more than double in size by next fall. Attendance is by choice with enrollment selected randomly from formal applications. Students are not hand-picked because of their academic ability, social standing or financial status. Therefore, a wide spectrum of socio-economic and academic achievement and ability level backgrounds is intentionally represented in the student body. One-third of the student population is eligible for free or reduced-price school lunches. Fifty percent of the enrollment is white and fifty percent is black. Many children come from poverty-level, single-parent, at-risk households. Others come from two-paycheck, professional families.

But the higher-than-ever expectation for success is the same for every child.

The Hayes Cooper Center is the first and only magnet school of its kind in the Mississippi Delta – and in the state and region as a whole. When it was only months old, the school began drawing curious educators from across the state and the southeast who would come first to observe, then to borrow and exchange ideas for teaching and inspiring students. In January 1992, the Center was selected as a model program in computer, math and science instruction by the regional education laboratory SERVE (SouthEastern Vision for Education) and the school's principal and district superintendent participated in a regional teleconference on how to replicate such an exemplary program. The Center, in May 1992, was one of six programs in the Southeast to be featured in a PBS documentary "Southern Solutions for Reaching the National Education Goals" produced by Jane Matheny and SERVE.

More than 500 educators from almost as many schools and school districts visited in the school and its classrooms during the Center's first year of operation. And teachers at the Center willingly volunteer as resource persons for other schools seeking to replicate much of what's going on inside Hayes Cooper's walls.

The Center serves as a working model for 32 other Mississippi Delta school districts who are working to integrate technology into their curriculum within the next five years.

In reaching into the community at large, the Hayes Cooper Center works hand-in-hand with Delta State University, a state-supported institution located in nearby Cleveland. Professors assist Center teachers in developing innovative curricula where textbooks are supplemental, not dictatorial, and serve as resource persons for the Center's classroom instruction. University students volunteer to teach physical education classes for the elementary students. And, in reciprocity, the Center often serves as a teaching resource and field laboratory for education students studying at the university.

Organization of the Center provides for a homeroom teacher in kindergarten through Grade 2 who, aided by a teaching assistant, is responsible for all subject area instruction. Grades 3 through 6 are team taught by a cluster of teachers each responsible for specific subject areas.

All students, from the youngest kindergartener through Grade 6 are also taught Spanish by a foreign language teacher three times a week in a special language classroom decorated as a Spanish courtyard. They visit a 28-station computer lab three times weekly where they log-in and work on computer assignments in English, reading and math that are individually programmed to meet their academic needs for that day. Also three times weekly, they move to the Center's fully equipped science laboratory where they conduct experiments directly related to their classroom discussions.

Choral music is taught once each week by a district employee. A team of parent volunteers with university art degrees provide visual art activities for every student weekly.

Additionally, the Center employs a full-time math specialist who works one-on-one with any student who falls behind their peers. Different teaching techniques, including manipulatives and practical-applications, are used to reach different learning styles. There is a speech specialist who works with students needing additional assistance. Two gifted teachers are responsible for an excellerated, enrichment program for academically advanced students. And a full-time librarian and library assistant assist students in develop research capabilities using traditional books and magazines – as well as a state-of-the-art multimedia computer station, CD-ROM players equipped with encyclopedias and modem-connected networks joining the Center to other schools and data bases across the nation. A satellite-fed, closed circuit television system brings each classroom in contact with teaching sources and learning experiences from around the globe.

In everything, the theory behind Hayes Cooper is NOT to simply improve on what's been do before in other schools, but to wipe the slate clean and allow the teachers to develop something completely new.

For example, instead of teaching science by beginning with Chapter One in a science textbook, students are invited into a laboratory setting that would rival practically any high school configuration. Then, they are allowed to touch and feel and measure and experiment – and they learn because they understand. And they

understand because they have "done it." When they return to the regular classroom, they have little difficulty in completing any testing of that material because they are not being asked to recall memorized facts. All they're being asked to do is to remember what they have experienced -- and this sort of knowledge isn't forgotten as soon as the next subject rolls around. It is internalized information that can be built upon later that year, the next year and in years to come.

In Spanish, students aren't asked to conjugate verbs or perfect spelling and punctuation. They are introduced to a second language in the same practical, common sense approach with which they learned their first tongue. Objects are identified with a naming word -- this time in Spanish. Then, simple commands are given. The students respond physically. Class is not an observation sport. It requires a total physical and verbal response. And it works. Just ask any kindergartner who has spent a week or two in the program.

This theory -- of allowing students to experience not just absorb information -- is carried through into every subject. In English, they don't just learn about the parts of a book, they write and illustrate and publish and bind their own. Then, the older students share their volumes with the kindergartners during one-on-one reading periods. In social studies, student don't just read about elections, they researched both candidates for Mississippi's governorship via electronic documents search, selected a mock candidate representative of their own, held political conventions, developed platforms and held an in-school election. (Which, by the way, matched the statewide outcome in the real election within two percentage points.) They also met face to face with the candidates and greatly surprised the adult politicians with the probing, factual questions that were asked. (A local press representative was even able to snatch a small "scoop" from the information solicited by a fifth-grade student during the candidates' forum.)

All in all, the Hayes Cooper Center for Math, Science and Technology is an ever-evolving educational creation that seeks to educate all children -- regardless of race, background or intellectual ability -- and to push them to achieve more than they ever dreamed possible and to prepare them to walk out of the schoolhouse door prepared to meet the ever-changing demands of tomorrow's workforce, to continue as lifelong learners and to be so dedicated to the importance of learning that they will pass this commitment on to the next generation.

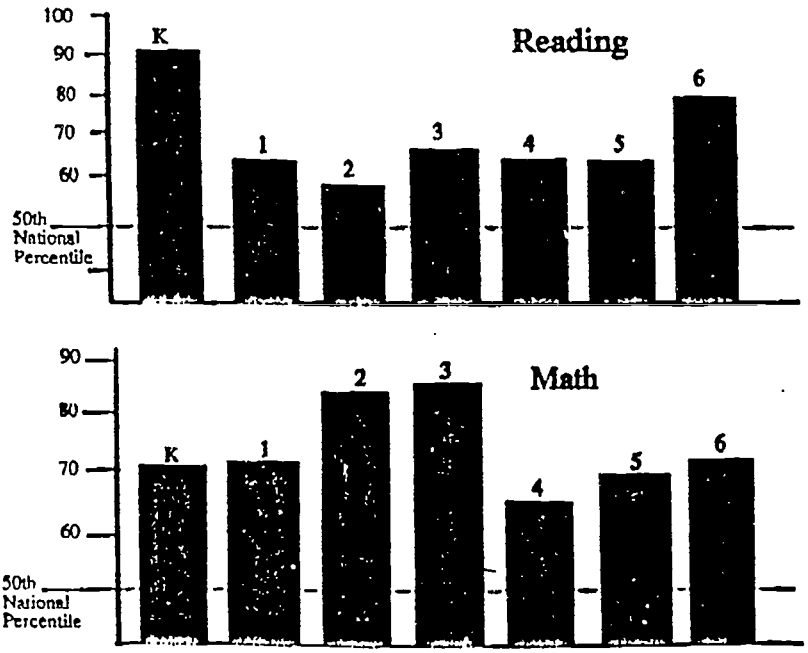
If it is anything, Hayes Cooper is indeed one of the most exciting examples of what can happen when state-of-the-art technology is infused into every subject, in every classroom for every single child.

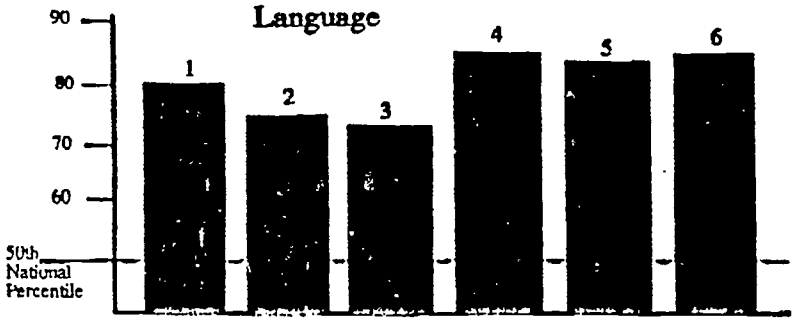
STANFORD ACHIEVEMENT TEST

Test Date: 4/92

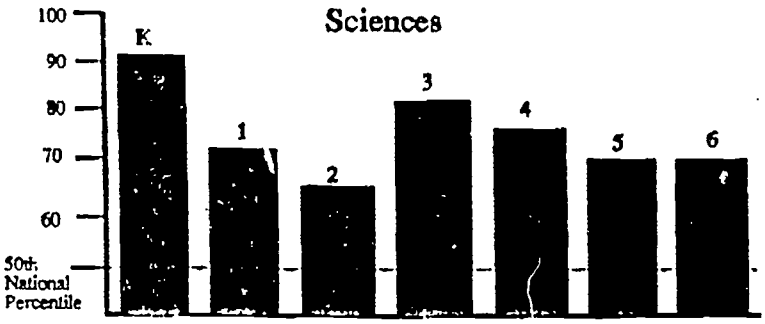
GRADE	Reading	Math	Language	Sciences	TOTALS
Kindergarten	90.8	71.6	—	91.8	88.7
First	63.6	72.6	80.7	71.6	72.6
Second	57.5	84.7	76.6	66.6	71.6
Third	66.6	86.7	73.6	82.7	77.7
Fourth	64.6	66.6	84.7	77.7	70.6
Fifth	64.6	70.6	83.7	70.6	73.6
Sixth	76.6	73.6	84.7	70.6	79.7

Scores given are the National Percentile Rank and Stanine of the Mean NCE.





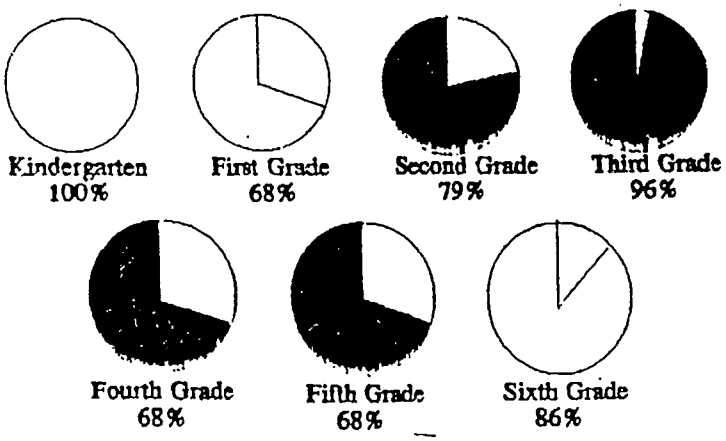
* The Stanford does not include a Kindergarten test for Language mastery



Count & Percent of Students Scoring at or Above the 50th National Percentile

GRADE	Reading	Math	Language	Sciences	TOTAL
Kindergarten	24	17		23	24
	100%	71%		96	100%
First	16	19	18	16	17
	64%	78%	72%	64%	68%
Second	18	27	22	19	22
	64%	96%	79%	68%	79%
Third	22	27	25	24	27
	79%	96%	89%	86%	96%
Fourth	19	19	25	23	19
	68%	68%	89%	82%	68%
Fifth	16	21	24	21	19
	57%	75%	86%	75%	68%
Sixth	22	24	26	21	24
	64%	86%	93%	75%	86%

Percentage score indicates the percentage of each grade's total enrollment that scored at or above the 50th percentile nationally.



The success of the instructional program was verified by the Hayes Cooper Center being recognized by the SouthEastern Regional Vision for Education (SERVE) as having an outstanding program in mathematics, science and technology assisted education. The school was selected out of 100 nominated programs and judged on innovation, effectiveness, transferability, and cost. The school is featured as part of SERVE's Sharing Success program and publications which are designed to encourage other schools to adopt similar innovative programs. In February 1993, The Hayes Cooper Center was selected by the Interlaboratory Research Network, as authorized by the U.S. Congress, as a national Program of Excellence in math and science education. This distinction will set the magnet school apart as a program worthy of replication in schools across the U.S. The Center's teachers will serve as resource individuals for other teachers and administrators seeking to create similar programs in their local districts. The Center will receive national publicity and dissimination of its curriculum during the spring and summer of 1993 as a result of this selection.

Also this spring, Hayes Cooper is expected to be cited by Redbook magazine as an innovative educational program in its annual recognition of outstanding schools. The Center will be cited for its advanced, hands-on science and math instruction that begins in kindergarten, its foreign language program for all grade levels, high academic achievement of its students and the strong parental involvement in the Center's operations.

The Jackson Clarion-Ledger newspaper, Mississippi's only statewide paper and the recipient of the Pulitzer Prize for education coverage, has named Hayes Cooper as "Mississippi's School of the Future" and featured the Center in two lead articles in the newspaper's series on education reform efforts over the past decade.

Senator BINGAMAN. Thank you very much for that testimony.

We'll hear from the other witnesses on the panel before we go to questions. We welcome next Geraldine Dirks and Philip Royball, who are a teacher and student team from Pojoaque High School in New Mexico.

Gerry.

Ms. DIRKS. Yes, thank you, Senator.

In my 21 years of teaching at all levels from early childhood to college, I have observed what these people before me have said also, that we are imparting knowledge and many facts to our students, and they are tested, and we want to see if they have retained that knowledge and if they have memorized these facts, and we direct them. And many of our students after they graduate are having a hard time dealing with the outside world in that they are not thinking critically, and they are not able to make decisions.

So our emphasis now seems to be on producing self-directed, goal-oriented, and lifelong learners, and in that way, they can demonstrate quality work in their community and become contributing members of society.

We find that our students now belong to the media generation. A lot of students at home have microwaves, and they go to the ATM with their parents to get their money, and they play with computer games, and they have cable, satellite TV, audiovisual and videotapes and cassette recorders and compact disks and, again, fast-moving electronic games.

Outside of the classroom environment, students are surrounded by technology and again, as they said, in the classroom we are still using the traditional teaching tools of the chalkboard, chalk, paper, pencil, and textbooks.

At Pojoaque High School, we have had to be very creative. Again, schools face limited funding sources. Our administrators have been leaders in coming up with innovative programs using and collaborating with the top resources that we have around us, which in our case is the Los Alamos National Laboratory.

We have a program with the Laboratory that is called the high school cooperative education program, where our students as seniors come to school half a day, and then they work as interns at the Los Alamos National Laboratory in the areas of math and science, engineering, general office work, shipping/receiving, data entry, and library media assistance. I guess it was necessary that our administrators have this vision because we are only 20 miles from this world class laboratory that solves complex problems that are of national importance using science and technology.

I wish I could have brought all of my students so that they could express to you how advanced the technology is that they use at Los Alamos National Laboratories. Because of our limited resource at the high school level, we are providing them with the basic concepts of technology. That's all we can do. But fortunately, as they go on to the labs, there they have unlimited resources.

Here are some quotes from my students: "Because of my basic computer knowledge, I was able to move into additional, more complex software programs and applications that prepared me with statistical analysis and data manipulation skills. My knowledge of software programs is vital to statisticians. We use SparcII, Unix,

Mathematica, which enabled me to help my mentor with programming codes and the creation of graphs for statistics."

Another quotation: "My familiarization with the network called "Internet" and knowledge of how to receive information from it allowed me to access materials from books and journals from the Library of Congress in Washington, DC."

Another quotation: "I helped my mentor with a project dealing with the computerized identification of cells that led to what caused leukemia."

These are three of my students who were in some of my computer application classes, and I am convinced they would have dropped out of school, but because we got them into this program at Los Alamos National Laboratory, they said: "I love my work. What we learned in the classroom is now real. People out there are actually doing this."

We also have a program in our schools that deals with special needs programs, called "Job Labs." These students rotate through our computer labs, and they have been able to use the computer-aided drafting program to integrate basic math skills to come up with structures where they design curves and lines and angles, and they apply their math skills.

One student is interning with an architectural firm, and after his experience the computer-aided drafting and design program at our high school, he is designing buildings, and now he will go out to the site and see that they are actually up. This is very exciting to him, because what he designed on the computer is now real, and he will pursue studies toward a degree in architecture at the University of New Mexico this fall.

I have listed only a few examples of how our students are benefitting from programs using technology in the learning process. Again because of our limited resources, right now we are faced with just imparting the basic concepts of technology at the high school level, and we are having to be creative and turn to these other resources around us.

Again, not every State and not every city or village has a laboratory like we have in their proximity, but I think what I am saying is that we have to be creative and turn to corporations and businesses and create partnerships so that our students are able to have access to this equipment.

I would like to see after this bill is passed many, many avenues where our students can perhaps work in science, and like Ms. Brandon said, we can measure the velocity in growth of a plant or the velocity of something dropping by using a probe and a sensor connected to a computer and plotting the information on a graph while the item is actually dropping, instead of spending hours plotting or graphing.

Our students at the elementary level will be able to read in their textbooks about a volcanic eruption, and at the same time their teachers, perhaps using a light pen, can read the code on her teacher's manual which will direct the laser disc to show the eruption on the screen.

We are taking a step in the right direction, and again I commend the Federal Government for looking into our needs. I think that

without your support, we will not be able to direct our students and enable them to compete internationally.

Philip Royball is one of our students who participates in the program with the Los Alamos National Laboratories, and he will speak briefly about one of the experiments where he used the advanced technology offered at the laboratory.

Mr. ROYBALL. One of the components of the high school cooperative program is the science internship program. The program exposed me to instruments, equipment and information that were literally mind-boggling. While working with the life sciences division, I conducted many experiments with both tumorous and normal cells. I will describe briefly some of the various instruments and techniques I used in this process.

I will begin with the first step, which was growing colonies. What we first need to do is decide how much of the sample of cells is needed for the concentration needed for the experiment. This will be done with a Coulter Counter, which is a laser-based instrument which is used to count the cells, and I use an extensive amount of math to change that to the actual concentration used.

We will then use incubators and grow those cells for a number of days. Our second step is preparing the sample for the flow cytometer. The flow cytometer is a laser-based system also, but it is much more complex. It uses three lasers which intercept through a flow system of the cell, and it is sent through a stream. As it intercepts, it is hitting receptors that can tell you different information about the cells, and that is hooked up to a computer, which then can be distributed into analytical form where you can use graphs and different things of that nature. And I will transfer that to another computer system with which I can make much more elaborate graphs and different things, and we will then have a group meeting and analyze this material.

I would also grow cells on slides and use photography with a microscope, and that was extremely helpful. One of the experiments I worked on may be published, hopefully. We still need to do a few more experiments on it, of course, but we'll have to see what happens. I am still waiting on that. But we had to follow many protocols which included using pH scales and things of that nature, which I have only read about in textbooks, and now I am using them, and this brings it to life. I see this, and I get so excited about this, and it keeps me interested. It's just such a great program. I never thought I would be working with things of this nature—I mean, cancer research—what more can you want at this age?

Senator BINGAMAN. Well, I think if you get that solved before you get to college, you're going to be doing great.

Mr. ROYBALL. Definitely, yes. So these are the keys to the development of useful skills which will certainly contribute to furthering my education by keeping me interested, and of course, a career.

Senator BINGAMAN. Thank you very much, Philip. I appreciate that description of what you are doing. I don't pretend to understand it all, but I appreciate it anyway.

[The prepared statement of Ms. Dirks follows:]

PREPARED STATEMENT OF GERALDINE RIVERA DIRKS

A transformation of education is under way! The purpose and goal of this transformation is to prepare all students to meet the challenges of today and of the 21st century--to be successful in cultural, personal, and work-related situations. The emphasis is to produce self-directed, goal-oriented, life-long learners who can demonstrate quality work in their community and become contributing members of society.

Today's students belong to the media generation--most have grown up with TV (cable or satellite), audio/video tapes, video cassette recorders, compact discs, and fast-moving electronic games. Outside of the classroom environment, students are surrounded by technology, yet many classrooms are still using only the traditional teaching tools--chalkboard, chalk, paper, pen/pencil, and textbook. Classrooms who have begun to explore the use of technology in the learning process have successfully produced students who are prepared to continue their higher education or enter into the work force possessing basic technological concepts and skills.

The challenge faced by our schools in this transformation of education is to, at all educational levels, develop and maintain a technology-enhanced curriculum designed to meet the needs of our students who are so accustomed to the quick pace of electronic entertainment and to the instant access of information.

Successful results of using technology as a teaching tool are evident in the school district where I teach. Credit must be given to the leadership of our senior administrators who 15 years ago had the vision to technologically enhance our curriculum through programs such as computer literacy, computer-aided instruction, computer-aided drafting and design, computer text and word processing, computerized accounting, and computer programming. There was a need to enhance our curriculum--our students reside within 20 miles from a world-class laboratory,

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the Los Alamos National Laboratory, who solves complex problems of national importance using science and technology!

Technology-enhanced curriculum did make a difference in our school district as evidenced by the following success stories.

Students participate in the High School Education Cooperative Program under the supervision of Los Alamos National Laboratory and our school district. Students apply basic computer concepts acquired in the classroom to internship positions in the areas of math, science, engineering, general office, shipping and receiving, data entry, and library assistant. Students' quotes describing their internship:

> "Because of my basic computer knowledge, I was able to move into additional, more complex, software programs and applications that prepared me with statistical analysis and data manipulation skills. My knowledge of software programs vital to statisticians--SparcII, Unix, Mathematica--enabled me to help my mentor with programming codes and creation of graphs."
>
> "Familiarization of the "internet" and knowledge of how to receive information from it, allowed me to access materials from books and journals from the Library of Congress."
>
> "I helped my mentor with a project dealing with the computerized identification of cells that lead to leukemia."
>
> "I love my work (word-processing)--what we learned in the classroom is now real--people out there actually do this." (I am convinced this student would have dropped out of school—this program kept here in and she proceeded to receive her Associates degree from Northern New Mexico Community College)

—

Our district's computer-aided drafting and design program was in place 10 years ago. Our students were able to enter post-secondary institutions as classroom assistants, competed in technology' competitions and consistently placed first. A student working with an architectual firm through our work-study program exclains:

> "The buildings I helped design using computer-aided drafting are now up!" (This student will pursue studies toward a degree in architecture at University of New Mexico this fall.)

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Our special education department in collaboration with our vocational education department designed a "Job Labs" curriculum for our special needs students. They rotated through the computer lab where they produced their own publication using word processing and graphics applications. The computer-aided drafting and design application allowed them to design simple structures with angles, curves, and lines integrating simple math concepts.

I have listed only a few examples of how our students are benefitting from our programs using technology in the learning process. Our students now know that electronic equipment is not only used for games and entertainment, but to prepare them for the world around them. They are feeling confident and excited and we are excited as well! They are doing research papers using our new library acquisition--the encyclopedia on CD Rom as one of their sources. Their information is entered, edited, saved, printed, evaluated by their instructor, retrieved, re-edited, re-saved, reprinted and they are happy! Our elementary school students now reinforce a math skill using a math game--it's fun--they're learning; or track an expedition by Lewis & Clark learning geography and decision-making skills in the process! Perhaps some time in the near future, we can link into networks such as technet and acquire information from any library!--or use E-mail to communicate with parents at their workplace! Our science students may be measuring velocity or growth using a probe or sensor connected to the computer and plotting the information on a graph simultaneously. Or reading about a volcano eruption from their textbook while the teacher reads the code from the teacher manual with a light pen to direct the laser disc to show the eruption on the screen.

Our educational system is taking a step in the right direction in beginning to address the technological needs of the classroom. This step, however, is barely inside the door. Education must serve our students and keep them competitive if our nation is to remain strong.

Senator BINGAMAN. Our final witness on this panel is Valerie Wilford, who is the executive director of the Illinois Valley Library System, and she is going to talk about the effects and benefits of technology on library services.

We are glad to have you here, Ms. Wilford.

Ms. WILFORD. Thank you very much, Senators Bingaman, Jeffords and Gregg.

I really appreciate the opportunity and am honored to be able to share with my colleagues in the kind of enthusiasm that has been demonstrated for this bold new initiative and certainly want to go on record as an advocate of the obvious.

In fact, Philip and I are trying to set a date for 6 weeks from now when I am going to be in Santa Fe so that I can see first-hand some of the work going on in this high school cooperative.

I am a school librarian, but for the most recent years I have been the executive director of the Illinois Valley Library System, which is a network of just under 100 libraries in 11 counties around the Peoria area in Illinois. Of those 100 members, 37 are school districts—one, an urban metropolitan school district, Peoria, and then the remainder, small rural districts surrounding that area. In addition, in this network participate public college and university and corporate libraries, like Caterpillar, medical libraries, etc.

These libraries voluntarily join together in a commitment to one another to share resources and to work together to try to meet the needs of their patrons. If I had lots of time, I could tell you lots of exciting things, but I guess I'll just say that as we move ahead, step by step, trying to bring these libraries into the 21st century, I am particularly grateful to members of this committee wearing another hat, who saw fit to grant us a $50,000 library service and construction grant so that all of our school districts and public libraries and academic libraries will in fact have one piece of the potential of a direct connection into the Internet, which will solve lots of our rural telecommunications problems as it relates to automation.

I am really excited about the kinds of things that you are trying to do, and I applaud and appreciate your inclusion and awareness of the role that school library media specialists can play in helping our students of today reach those educational goals that loom ahead of us, particularly in the selection and evaluation and use of a wide variety of different kinds of resources.

And I do not, Senator Bingaman, want to make what I need to share with you in any way a downer or a sense of a lack of enthusiasm for the initiative, but from my perspective, as you are shaping and refining the kind of direction you are going, I want to share with you a parallel concern that may not be appropriate for 1040; it may be need to be a parallel kind of activity. And that is really the very serious problem that school library media centers across our country are having in trying to meet information needs of learners with really antiquated and outdated resources.

I am sure you all are probably more familiar than I am with the history of what happened with the Elementary and Secondary Act in 1968. And as we have done national and, recently in Illinois, a State study of, for instance, the average copyright date of materials in key areas, particularly science, what we are discovering is that

average age of materials in 1968 and 1969, collections have deteriorated since we have pulled away that sort of categorical earmarked funding that went into building school library and media centers in the late sixties and early seventies. When it sort of got included in Chapter II block grants, you began to see a deterioration. And the situation across the United States—and I have cited in my written testimony some of the specific information about what is going on—that, coupled with the escalating cost of materials today, means that school media centers in many cases spending an average of $5.83 per child, in today's world with our 6 percent inflation rate, are not even able at the secondary level to buy one-fourth of a book, let alone CD-ROM, any of the software applications that are so critical to developing the kind of critical thinking that some of the students present today have been demonstrating.

I also cited in my written testimony a recent study that was done in Colorado which is a very dramatic demonstration that the single most important variable in determining and assisting in student achievement is the existence of a wide variety of all kinds of resources to support their learning.

Now, you all are the experts legislatively. I can only tell you that as I observe resource sharing going on in my area among libraries—and I do want to tell you that last year, among my 100 libraries, there were over 286,000 information exchanges among those libraries—that the ones that are falling further and further behind in their ability to share in the resource sharing are my school library media centers.

The other libraries are within the restrictions of copyright and their own budget and staffing concerns, doing what they can do to hopefully supply the extraordinary materials, but the school libraries are not able to supply basic needs of their students. And I am not sure what the most appropriate way to deal with this is, whether it be taking a look at the reauthorization of the Elementary and Secondary Education Act, earmarking a percentage of dollars in Chapter II or rolling them into Chapter III, to make sure that at the same time this exciting momentum that you are building is paralleled with the development of collections.

As my colleague is concerned about hardware obsolescence, I am concerned about resource obsolescence and the fact that those resources are not there.

So I hope I did not diminish the kind of excitement going on here today, but as you shape and refine this bill, I hope that you will remember the Henry Skanatchewein High School outside of Peoria which, in 3 months, will have the same access as the Sidwell School in Washington, DC to resources on the Internet if your link moves ahead—but they are not going to be able to participate in this fragile resource sharing going on which is so exciting unless we do something about the resources that are available to students in our schools.

Thank you.

[The prepared statement of Ms. Wilford follows:]

PREPARED STATEMENT OF VALERIE J. WILFORD

Chairman Bingaman and the other distinguished members of the Senate Committee on Labor and Human Resources, I am honored to be invited to present testimony as you consider S.1040, the Technology in Education bill.

My name is Valerie Wilford, I am a school library media specialist and am currently Chair of the American Association of School Librarians National Conference, Shape the Vision to be held in Indianapolis in the fall of 1994. For the past several years, I have served as Executive Director of an eleven county regional library system in West Central Illinois with a membership of just under 100 school district, public, academic and special libraries committed to resource sharing.

Technology in Education represents a bold and dramatic legislative response to the National Educational Goals. This is a significant piece of legislation which represents a major structural reorganization.

I applaud, appreciate and support the recognition and inclusion of the nation's school library media centers and school library media specialists as an integral-- an essential element, a partner, in the educational infrastructure. If we are committed to achieve the National Educational Goals, the need for strong and vital school library media programs is clear. In order for our nation to achieve a ninety percent (90%) graduation rate, a perfect adult literacy rate, and achieve national leadership in math and science by the year 2000 students will need to develop the ability to access, evaluate and use information. Providing and ensuring access to and the effective use of information and resources is a long standing responsibility and commitment of school library media specialists. (AASL, p27)

Technology is playing and will continue to play a key role in providing access to the information critical to the development of tomorrow's leaders. The recent revolution in information and instructional technologies has provided school library media specialists with unprecedented opportunities and challenges as they provide leadership for the incorporation of educational technologies into the school's curricular program, assess, and promote the effective utilization of those technologies. (AASL; 1989)

Yes, technology will play an important part in the achievement of our nation's educational goals --but it is not the only part. A blend of technology, access to a wide variety of resources and vital school library media programs will be required.

Funding available for education in our local school districts has declined. Every decision to spend money takes on increased importance. There is often a strong temptation to buy new technology to satisfy our desire to be "on the cutting edge."

I commend you on the inclusion of two of the elements from S.266, the Elementary and Secondary School Library Media Act in S.1040. Technology is only one element in the solution. However, an essential component of S.266 has been ignored -- the need for strong school library media collections and programs.

SCHOOL LIBRARY MEDIA PROGRAMS "AT RISK"

The reality is that our nation's school library media programs are "at risk." Funding for school library media centers has declined significantly over the last ten years.

The Elementary and Secondary Education Act of 1965 provided targeted, separate funding for school library media programs and resources. During the last dozen years, however, all funding for school programs were merged into the block grants of Chapter 2. As a result of this consolidation funding for school libraries declined dramatically, and I might add total funding for the Chapter 2 Block Grant Program has decreased in the past several years.

"Expenditures for Resources in School Library Media Centers FY1989-1990" is the fifth in a series of School Library Journal (Miller, Shontz 1991) reports summarizing expenditures for public and private school library resources in the United States. The report documents the steady and continued erosion of funding to school library media programs. An update of the survey is under way now and preliminary data reveals an even more deplorable situation.

In my own state, during the Spring of 1993, the Illinois School Library Media Association conducted a study of Illinois public and private school library media center collections in the areas of astronomy, space science and the solar system; general biology and ecology; and human anatomy, physiology and hygiene. The results of the study have not as yet been published but I would be happy to provide a copy for the record at a later time. I would like to share just a few of the highlights of that research with you.

-- The Illinois survey data documents the national trend that funding for school library media center programs has eroded over the past decade.

-- The data suggests that Illinois school library media center collections in the topical areas surveyed are old, reflecting funding of the late 1960s and early 1970s.

-- Sixteen percent (16%) (N=404) of the respondents reported that they spent less than $3.00 per student for library media resources in 1991-92. The average cost of a book in 1991 was $13.07 at the elementary level and $42.12 at the secondary level. (Bowker, 1991) Thus, a $3.00 per student expenditure in 1991 would buy less than 1/4th of an elementary book and less than 1/10th of a secondary title.

-- Eighty-eight percent (88%) of the respondents reported that astronomy, space science and the solar system was a part of their school curriculum, but forty-five percent (45%) have fewer than 20 titles on these topics. Forty-three percent (43%) have fewer than six books published between 1990 and 1993 about these subjects. Sixty-six percent (66%) responded that they have more than 20 titles published before 1970, twenty-three years ago.

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PRICE OF LEARNING RESOURCES HAS ESCALATED

Learning materials are very expensive!! The average cost of books and other resources has escalated in recent years. The average children's book cost just over $3.00 in 1965; now it costs over $15.00. A secondary book title today averages over $42.00. (Bowker 1991)

Today's students require a wide variety of resources, not only books and periodicals, in order to be information literate. Access to information in newer formats such as CD-ROM, video, and computer software while crucial is priced out of the reach of a majority of school libraries.

STRONGEST PREDICTOR OF ACHIEVEMENT TEST PERFORMANCE IS SCHOOL LIBRARY MEDIA EXPENDITURES

Two studies, both published in 1993, explored the contribution of the school library media center (SLMC) to student achievement and the value of free reading.

Findings from the Colorado study (Lance, 1993) include:

- The size of an SLMC's staff and collection is the best school predictor of academic achievement.
- Among school and community predictors, the size of the SLMC staff and collection is second only to the absence of at-risk conditions, particularly poverty and low educational attainment among adults.
- Students who score higher on standardized tests tend to come from schools with more SLMC staff and more books, periodicals, and videos -- regardless of other factors, including economic ones.
- The instructional role of the school library media specialist shapes the collection and, in turn, academic achievement.
- School library media expenditures affect SLMC staff and collection size and, in turn, academic achievement.

Conclusions from the Power of Reading (Krashen, 1993) support:

- Voluntary reading is the best predictor of reading comprehension, vocabulary growth, spelling ability, grammatical usage, and writing style.
- Access to SLMCs results in more voluntary reading by students.
- Having a school library media specialist makes a difference in the amount of voluntary reading done.
- Larger school library collections and longer hours increase both circulation and amount read.

The combined Colorado study and the Krashen review of research present "a powerful argument for the support of strong library media programs as an essential component in every school. Adequate SLMC budgets, materials, and staffing, as well as techniques that encourage the effective use of library resources, lead to higher student achievement." (Loertscher, 1993)

FEDERAL $'S FOR SCHOOL LIBRARY RESOURCES WILL GO MUCH FURTHER IN 1993 THAN IN 1968

Within the school setting, it is often the librarians, more than those in any other disciplines, who have embraced and enhanced automation. They did this NOT to make their jobs easier - in fact, automation opens up so many opportunities and makes so much possible that the librarian's job is more complex now than it ever was. It is ever so much easier to simply say, "I'm sorry but we don't have that" and move onto other things than it is to master the intricacies of remote database searching.

But librarians DID embrace and enhance automation, and they did it because of their commitment to the concept of equal access to information. What started years and years ago as library-to-library sharing through the exchange of handwritten requests has evolved to the instantaneous transmission of full text documents from sites all over the world. But the bottom line has never changed for an instant - access to information, for absolutely everyone who needs it.

Indeed, the school office uses automation to prepare schedules and computer grades; various "technologically-minded instructors" make available computer programs to enhance their curriculum (those programs usually are ordered by, cataloged by, demonstrated by, housed by, and maintained by the librarian); and more and more students use computers for word processing.

But it is the librarians who have consistently and doggedly lead the way in the application of automated systems to enhance learning. And all of this research, development, and application has been done with the understanding that one of the primary purposes of library automation is for resource sharing.

Here's the bottom line -- at this moment, thanks to the insistence, creativity, and philosophical foundations of American librarians, the student in tiny Henry-Senachwine High School in Henry, Illinois has virtually the same access to the same materials as the student in the Sidwell Friends School in Washington, D.C.

And librarians are justly proud of this...

But there is another side to this story - and it is this side of the story that you must concern yourself with the most.

In just the past few years, the focus of library service has changed so dramatically, so rapidly, that now it often times is easier to secure hardware and software than it is to keep on the shelves an updated collection of books. Foundations continue to fund innovative uses of technology, and the PTA is zealous collecting enough soup can labels to get the school district a new computer.

And all of that is WONDERFUL -- but what about the books, the resources, the sharing in resource sharing...

Consider again Henry-Senachwine High School. Here is a school library with a collection of fewer than 5,000 volumes, most of which are so dated as to be virtually worthless. It is little wonder that when the Henry-Senachwine Library was able through grant funds and great local effort to secure a computer and modem, the school principal and the school board member present

at the installation were elated. Now their students would have access to library collections throughout Illinois and throughout the United States. In the ten minutes it took to hook up the computer, the students in this school went from access to 5,000 dated volumes to the entire collections of thirty-six colleges and universities in Illinois, to the collections of major metropolitan libraries, even to more than twenty-eight million records of the Library of Congress now accessible through the INTERNET.

But in the midst of all of this excitement, there was one individual who had reservations -- the school library media specialist. Katie Grumbine, who has been at the school long enough to remember when this year's seniors were starting kindergarten, had tears in her eyes when these final connections were made. More than anyone else in the room, she knew the significance of what was happening.

But, her first words to me had nothing to do with what databases she could search, with what possibilities now were hers. Her very first question was, "...but what can we possibly have to share, to give back, to loan to other libraries?"

And there it is...

That attitude is the norm among librarians. Were it not the norm, we never would have gotten this far. We never would have reached this level of resource sharing. We never would have had librarians so eager to allow remote access to their collections. We would never have seen this incredible development of library automation. System designers are not in the business of creating systems that will not be used. The sophistication of the systems that have been developed attests to this attitude -- there is among librarians a market for the tools of sharing.

But as Katie Grumbine realized, in order for this to make any sense at all, we must have something to share...

Katie Grumbine now has the ability to essentially eliminate her book budget and rely on the collections of others. But that will never happen. Instead, Katie will devote even more time, energy, and expertise to the development of her collection, and she will participate wholeheartedly in coordinated collection development - programs designed to enhance the cooperative planning of and sharing of materials. This is where remote access really shines. This is what can make all those automation dollars worthwhile. The combination of coordinated collection development and automated resource sharing is what can save American libraries from the consistently shrinking tax dollar. It is a cost-effective approach to guarantee equal access.

But there must be something to share...

In 1968, federal dollars were used to put a collection of books in libraries A, B, C, and D. Students in Libraries A, B, C, and D then had access to the very latest print information. That program in 1968 was a tremendous boon to school libraries and to education.

But here is the remarkable thing...

Resource sharing is built on a foundation in which school libraries (all libraries), strive to meet the basic needs of their students and teachers at the local level and then share with one another those resources required.

Because of librarian's commitment to equal access to information, adherence to the provisions of copyright restrictions, and the automated resource sharing systems thereby engendered, federal dollars for school library reaources in 1993 will go much, much farther than in 1968. Is there any other area of government spending which can make the aame claim?

In 1993, federal dollars can be spent to put a collection of resources in library A, a different collection in library B, still a different collection in library C, and yet another collection in library D. Through automated systems for resource sharing, through fax technology, through the INTERNET, each collection will be accessible to each library. Moreover, each collection will also be accessible to libraries E, F, G, H, and all the rest.

CONCLUSION

As you deliberate and design a legislative response appropriate to the achievement of the nation's educational goals:

-- I implore you to guarantee student access to the wide variety of school library media center resources and skills that will enable them to become lifelong learners.

-- I ask you to reexamine the components of S.266, the Elementary and Secondary School Library Media Act.

-- I ask you to recognize legislatively that "library media centers and their collections are not fixed assets. Adequate local educational programs cannot be developed unless a wide variety of learning resources are regularly replaced and updated." (Miller and Shontz. p.43)

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Senator BINGAMAN. Thank you very much.

Let me also say that Senator Simon, who has been a real leader on this issue here in the Congress for a great many years, would have liked to be here himself. He is also, like Senator Kennedy, committed to the hearing on Judge Ginsburg today, so he is not able to be present at our hearing.

Ms. WILFORD. Thank you.

Senator BINGAMAN. Let me just ask a couple of questions and then defer to my colleagues here.

I was struck by the point that Annemarie Ryan made about the fact that the result of this activity in Massachusetts is that students are going to their textbooks more rather than less. I think that is an interesting insight into what we are talking about trying to stimulate here. This is not an alternative to traditional forms of learning; it is a way of incentivizing and motivating students to pursue that.

I do not know whether you have any further comments on that, Annemarie, but I thought that was a very interesting point.

Ms. RYAN. I thought it was an interesting point, too, and it has come up before, but it came up quite a bit yesterday when I was talking to some of the EMMAT teachers about coming down today to testify and wanted their opinion and to see if they had any input. And time and time again, if you enhance a child's learning so that it empowers him to find that information rather than requiring paper and pencil—open your book to page 42—he is going to want to go to the book. That is what we are finding, and the other interesting item of that piece is that for so long, kids have gotten away from writing—everyone has—you make a phone call now. You don't write a letter home.

For instance, when you pair students on a computer—and many of the teachers have said to me, "I would like a computer on every desk," but there are teachers a little bit more, to me, astute—that's my opinion—in that when I taught computer science at the high school level and also for special needs students many years ago, the pairing of a student was vital to the process especially if you had a low-level student and high-level student.

Now, many parents get upset at that and ask, "Why should my high-level student be working with a student of low level?" And the interesting thing is that if that student, when he graduates, goes into a manufacturing plant or into a business and is a manager for other people, then he is going to have to learn to deal with all kinds of people, and that is what happens. And also, instead of having kids make fun of other kids, they pull them into this process and say, "Well, let's look it up in the book," or "Let's find out more information," or ask the teacher where can I go for this information. Where would you go? You would go to the library. We are finding it more and more.

Senator BINGAMAN. Let me just ask another question for any of the other witnesses who wish to comment. We have tried in this bill to sort of lay out a comprehensive approach to Federal support for use of technology in the schools, and there are a lot of different items in that—funds for planning how schools can better utilize technology, funds for training of teachers, funds for purchase of equipment. We are obviously going to be scarce in Federal funds

even if we are able to pass this. Which of these things is the most important thing that the Federal Government can do?

Dr. Kitchings, did you have a point of view on that, or any of the rest of you?

Mr. KITCHINGS. That's an issue I feel very strongly about. I feel very strongly that the key to the whole process is to train the teachers first. We can have all the equipment and software that we need and want or ever dreamed of having, but if the teacher is not committed to this, it is money not well-spent.

So from my vantage point as a school administrator, the teachers must buy into this process.

Senator BINGAMAN. Do you think more programs like that one described in Massachusetts, this EMMAT—what does that stand for——

Ms. RYAN. Elementary and Middle Math and Technology.

Senator BINGAMAN. All right. Yes, Gerry?

Ms. DIRKS. I think it will be impossible to equip every classroom with the technological equipment that we need and train every teacher. All the conferences that I have attended on technology, it seems that some of the answers or some of the suggestions that have been mentioned are that we have labs that are manned perhaps by two or three people who are very knowledgeable, and that those labs are accessible to all students. That way, not everybody has to be trained at first, anyway. And I think that those labs should probably be at the library media center. The library media center should have four or five people who can work with students in research, in computer-aided instruction. I think there should be equipment that the science teacher can check out and use LCDs or probes or sensors when they need them. But right now, I don't think that we will be able to train everybody, and I don't think we will be able to equip every classroom.

Senator BINGAMAN. Julie?

Ms. STOGSDILL. The chairman of the Buddy System Project is Dr. Arthur Hansen, the president emeritus of Purdue. And now that we are in our sixth year, and we have some byproducts that have sprung off, Dr. Hanson is working with several deans of education at Indiana colleges and universities, and his personal goal is to work with the deans of education to encourage teacher training within the university. We provide training as do these other programs, and all of our teachers say that they could not exist without it. But Dr. Hanson believes that we need to work with the universities and colleges so that teacher education includes technology.

Senator BINGAMAN. Thank you very much.

Let me defer to Senator Jeffords for any questions he has.

Senator JEFFORDS. Thank you, Mr. Chairman. First, I have a statement that I wish to make a part of the record.

Senator BINGAMAN. Without objection, it will be included in the record.

[The prepared statement of Senator Jeffords follows:]

PREPARED STATEMENT OF SENATOR JEFFORDS

Thank you, Senator Bingaman. I am looking forward to the opportunity to explore the use of technology in our nation's schools in more depth. In a rural state such as Vermont, the use of tech-

nology in the schools can no longer be thought of as a luxury but rather as a necessity if we are to keep pace with a changing society and expect students to be able to compete in a global economy. We live today in an information society and access to technology provides students, especially those students living in isolated areas, with access to information. In many areas, where certified teachers, extensive libraries, and other resources are in short supply, technology is essential to make those important linkages to the outside world.

Although you might think that a state in which most schools are in rural districts would be rich in technology, that is unfortunately not the case. In fact, Vermont ranks 41st among the 50 states in what is called "microdensity;" in other words, Vermont has fewer computers, VCRs, televisions, satellite dishes, and other technologies per student than the vast majority of States. Even among districts within the State, wide disparities exist and some students have access to new technologies while others do not. As you can imagine, those students who could benefit the most have the least.

In fact, the students that often have the least are in the most remote rural areas. Although we often focus on the glaring educational needs of the inner cities, when it comes to technology, it is the rural areas that have the most difficulty and the largest expense in obtaining technology. I think that any federal legislation will need to account for the higher costs of connecting students to technology in rural areas.

At this point, I am interested in finding out more about what the appropriate federal role might be. I know that schools, teachers, and students desperately need funds to purchase technology because they simply cannot afford it in their local school budgets. I also know that teachers must be trained to fully integrate any new technologies into their teaching.

I am looking forward today to hearing from teachers and students about how the best technology is presently being used in the schools and to hearing from software and hardware developers about what new technologies we can look for in the future.

Senator JEFFORDS. I am very interested and have been for many years in what can be done with technology that is available in education, but I also get discouraged. I have been around here now for 18 years, and I have worked with employment training over in Baltimore, with the Plato programs back in the early seventies, saw the IBM Writing to Read programs come in in the late seventies and early eighties. And yet I see really very little change in the access of students.

I come from Vermont, a very rural State. We are advanced in some areas, like interactive television, but we are 41st in terms of density of the number of computers available, especially in our very rural schools.

You all apparently come from areas that seem to be doing very well in the sense of access. Are any of you from a poor area, either urban or rural?

Ms. BRANDON. Our little school is in the poorest region in probably the poorest State in the Nation, and I think the contrast has been what is so amazing. These children have almost been written off. They can learn to a certain level, and that's all we can come

to expect. But what we have found is—and we could not have done it without Federal assistance—the economy in the local area as well as the State of Mississippi could not afford for us to do something like this. That is the unfortunate part of all of this. The students have been given the tools, and they can do it. It is heartbreaking to see, 2 miles up the road, a school with a computer, but it sits in a dusty room because nobody knows how to turn it on, and that's all they have.

There is a great disparity here that needs to be corrected, and we are an island right now. There is so much that could be accomplished if other schools could do it.

Senator JEFFORDS. What is the biggest problem with respect to better utilization of computers? Is it inertia with school boards, inertia with teachers, lack of money—what do you all think is the great problem we have in spreading the utilization of educational technology?

Dr. Kitchings.

Mr. KITCHINGS. From my vantage point, I think it goes back to what Ms. Ryan and Julie said. I think the training must be there. If teachers coming out of the schools of education have some computer background and can be shown the advantages of incorporating the technology into the classroom, for lack of a better word, I think they will worry their administrators enough that they will seek funding from whichever source is available.

So I think it is an all-inclusive problem there; I think everybody has a share of the problem.

Senator JEFFORDS. Geraldine.

Ms. DIRKS. I think another problem is that technology changes so rapidly. I mean, 5 years ago, our XTs were fine. Our XTs are obsolete now. Every time we turn around, there is something new on the market that is being marketed to schools. Right now, we don't have a plan as to what is going to be used, and because of the rapid changes in technology, public schools cannot afford to keep up with it.

I think that is why we have to—I don't know if the Government has to offer incentives to the corporate world to share with us, but something has to be done so that we can keep up with all the technological advances that are springing up every, single day that the school districts cannot afford.

Again, 2 years, and the equipment is obsolete. That is why we try to focus on the basic concepts and then turn to the Government agencies or to the corporate world to help us with more advanced equipment.

Senator JEFFORDS. What information or expertise is available to you all to determine as to whether or not something new on the market is worth the money that would be required? Are there any coordinated educational institutions that provide that information, or are you just at the mercy of the salesman?

Ms. DIRKS. That's it. We attend technology conferences, and all the vendors are there, but in reading your bill, I see that you might give some leadership in affording to us a consortium or a committee of people who can kind of State what we should be doing, perhaps, at the secondary level, and what should be done at the uni-

versity level, to guide us through what equipment or what concepts we should be stressing to prepare our students.

Senator JEFFORDS. Yes, Julie?

Ms. STOGSDILL. I would like to say, though, that being a program that works for 4th, 5th and 6th graders, the kind of technology that elementary school students need is not the same kind that students directly preparing for the work force need. We consider a 6-year obsolescence cycle for our consider. The school district chooses its own platform, so we have about half and half, DOS-based and Apple-Macintosh platforms, so the students are also able to negotiate between platforms even when they have never been exposed to the other because of their level of self-confidence.

So elementary school students, in our opinion, do not need the most current thing that is on the market, and some of the basic software integration programs—and an example of that is Microsoft Works, for example, which we use extensively—work well and will work well for a long time for elementary school students, and that gives them the confidence, then, to learn the more sophisticated equipment when they have access to it.

Senator JEFFORDS. If I am an administrator in an elementary school, whom would I go to to help me make a decision as to what software or hardware I should buy?

Ms. STOGSDILL. Within the Buddy System Project, we have an implementation manager, and this is a woman who was for many years a classroom teacher and has a great deal of expertise in educational technology. She oversees the entire education program. But the school districts——

Senator JEFFORDS. Is that for the State, or locally?

Ms. STOGSDILL. For our project; so, for 50 schools. But most school districts, I believe, now are having an educational technology coordinator—that person has different names—but there usually is a person within districts—not within tiny, small districts, but within districts—who helps to make those decisions. But once a school district is chosen for the Buddy System Project, it has some assistance. But the school district still chooses its own curriculum.

We use a private line switching telecommunications network for all of our students that runs over Microsoft Works, but they are not forced to use a specific kind of software.

Senator JEFFORDS. Thank you, Mr. Chairman.

I have to go onto the floor for the national service bill. Thank you very much. You have been very helpful.

Senator BINGAMAN. Thank you, Senator Jeffords.

I think all of this testimony has been very useful. We do have to move on to another panel, but I appreciate the witnesses all coming and testifying, and we will include your full statements in the record and use this testimony in trying to persuade our colleagues to pass this bill.

Thank you all very much.

Let's take about a 4- or 5-minute recess while the second panel comes forward and takes their positions at the witness table.

[Recess.]

The idea of the second panel is to demonstrate opportunities available to classrooms through technology. We have an impressive array of options for educational hardware and software.

We have three major presentations here of three types—on behalf of public television, Stanley Johnson, who is a teacher at Thomas Jefferson Junior High here in the District of Columbia, will demonstrate the media fusion project with two of his students, Jacqueline Fisher and Lateef Abney.

Why don't you go right ahead, Stanley?

STATEMENTS OF STANLEY JOHNSON, TEACHER, THOMAS JEFFERSON JUNIOR HIGH SCHOOL, WASHINGTON, DC, ACCOMPANIED BY JACQUELINE FISHER AND LATEEF ABNEY, STUDENTS; JOHN KERNAN, CHAIRMAN, JOSTENS LEARNING CORPORATION, ACCOMPANIED BY W.H. GERALD CALDWELL, JR., EDUQUEST MARKETING PROGRAMS AND SUPPORT DIRECTOR, AND JEFFREY H. ORLOFF, MANAGER, NATIONAL PROGRAMS MARKETING FOR APPLE; RICK LANE, CO-FOUNDER, MODERN EDUCATIONAL TECHNOLOGY CENTER, ACCOMPANIED BY MICHAEL S. SWETNAM, GTE INFORMATION PROCESSING SYSTEMS, VALERIE THAMES, TEACHER, AND AUDREY HILLMAN, STUDENT

Mr. JOHNSON. Thank you very much, Senator.

My name is Stan Johnson, and I am a teacher here in Washington, DC at Jefferson Junior High School. I am here to describe the media fusion project, which is a collaborative effort with PBS, WETA, which is our local PBS affiliate, and Apple Computer, Incorporated out of Cupertino, CA. With me today are two of my students, Mr. Abney Lateef and Ms. Jacqueline Fisher, and once I am through with the demonstration, I will ask them to explain some of their experiences with the project.

We used the "MacNeil-Lehrer News Hour" as our central core of information, and what media fusion actually does is allow students to get behind the news from many discipline facets. They can explore information from a mathematics perspective, a science perspective, which is my discipline, and also a social studies perspective.

I would like to direct everybody's attention to the screen here, and what you are going to be seeing is a video clip from a "MacNeil-Lehrer News Hour" that we edited down to 2 minutes for the actual project, and this particular piece is on global warming. [VIDEOTAPE SHOWN]

Mr. JOHNSON. Let me turn this down for a minute to explain actually what happens. Students, prior to actually sitting down and viewing the snippet that you see here, are introduced to the concept within the concept of the classroom, and the original, 20-minute "MacNeil-Lehrer" piece. I usually try to find out what their baseline knowledge is relative to that particular issue being discussed, generate some questions so they are clued in to what is going to be going on relative to the unit of study, and then put them in front of the computer to let them analyze the information.

What is being referenced is information relative to the amount of carbon dioxide increasing over a 30-year span, and what you see happening now, as that video piece runs, it triggers an online

database which causes the information that is referenced in the video piece to appear on-screen.

Now, what makes this a little bit different than some of the other pieces of software that you'll see out there now is the fact that students can actually go into the dataset and amend it. So if there is any information that is missing from the particular dataset, they can go out to other outside resources to amend the dataset, put that information in, and it automatically becomes a variable in the unit of study that is being analyzed.

Once they have gone through the entire set of information and views of the data that we have, I usually have them work cooperatively in front of a computer, three or four students in front of a computer, and find out what information they have gotten from both the video and from their own discussion that they would like to analyze further.

What you see on the screen now is Mr. Abney, and I am going to take you through an argument that he developed relative to his analysis of this information. [VIDEOTAPE SHOWN]

Mr. JOHNSON. Now what you see happening is that the information that he has referenced is highlighted in the upper right-hand corner. [VIDEOTAPE SHOWN]

Mr. JOHNSON. That is called a "video note," and what makes our project a little bit more dynamic is the fact that we are not only working as a community of learners here in Washington, DC, but we are sharing this information with our sister school in San Rafael, CA, Davidson Middle School. So this "video note" was created, and we sent it by way of our VSAT satellite connection which is provided by PBS.

So I am going to now go to the next note in the series that Davidson sent back to us in response to Lateef's note. [VIDEOTAPE SHOWN]

Mr. JOHNSON. So they had a question as to his analysis—what are you talking about, Lateef? And when he got this back, I have never seen a student take to his own personal analysis the way I have seen students take to working with this particular piece of software. He was compelled to make sure he got this particular piece of information analyzed correctly and to put it back out on the airwaves. And I think one of the reasons is that he has taken complete ownership of the information. He is not only working with the information, but that actual video link has made him part of it, so he has taken complete ownership of it.

And when Lateef got that response back the next day, he stayed until 5:30 that following day to make sure that his analysis was correct and that information was going back. And most kids, at 3:15, are trying to knock down the door; he was there very much until dark, making sure his information and analysis was correct. [VIDEOTAPE SHOWN]

Mr. JOHNSON. So you have just seen one example of an argument that was started on one end, shared synergetically, and developed within the community of learners and evaluated. And that is what we are moving toward. As an instructor, it changed my dynamic in the classroom. I am no longer the sole giver of information. I have become more of an academic facilitator or an academic coach, and we set up the parameters as educators for them to work within,

and they are allowed to explore freely, without ridicule, things that they find interesting. This would not have been possible without the donation of hardware and software and technical expertise by Apple Computer and PBS.

I just finished demonstrating this particular project in front of the members of PBS stations at the annual meeting—over 351 member stations—and PBS has made education their number one goal going into the next century. When Mr. Christianson put that out, it was met with a roar of applause and affirmation. So PBS has now committed themselves to making education their number one priority.

At this point I'd like to turn the demonstration over to Mr. Abney and Ms. Fisher, and you can feel free to ask them about some of their experiences.

[The statement of the Association of America's Public Television Stations follows:]

STATEMENT OF THE ASSOCIATION OF AMERICA'S PUBLIC TELEVISION STATIONS

The Association of America's Public Television Stations is a nonprofit membership organization, representing over 350 public television stations nationwide. We appreciate the opportunity to testify before the Senate Labor and Human Resource's Committee hearing on S. 1040, the Technology for Education Act of 1993. In view of the fact that our oral testimony will consist of a demonstration of our Media Fusion project—which is just one example of public television's extensive work in education—we are submitting this formal written statement to provide broader information on the role that public television is playing in education, and how we can contribute to the goals expressed in S. 1040.

APTS strongly supports The Technology for Education Act of 1993. It is of enormous import. It provides federal leadership and support for technology in the classroom which will bring schools into the 21st century. The need for this legislation cannot be overstated. Unfortunately, for far too many schools, state-of-the-art technology is slate and chalk. But we do not live in a slate and chalk world. The gap between technology in the classroom and use of technology in the world beyond the classroom grows ever wider, and we may soon reach a point where we cannot catch up. The public television community is well aware of this great disparity, and we are alarmed and concerned by the growing gap.

PUBLIC TELEVISION STATIONS BRING LIFELONG LEARNING TO HOMES, SCHOOLS AND WORKPLACES

Public television has had a long history of partnerships with schools, school systems, educators and parents to promote greater learning. Local public television stations, PBS, and CPB have sought at every turn to bring their rich educational programming and engineering resources to bear on improving education nationwide.

Public television was created when the new technology was television. With the forward march of progress, public television is now adapting new technologies for use in education. Public television stations serve as a community resource for this purpose. They are locally based, serving local constituents and communities. They offer schools and other educational institutions in their service area experience and expertise in using technology and telecommunications. They have developed partnerships with the educational community, they have "reversioned" their programming for instructional use, and they play a central role in adapting technology for education. A survey by the cable industry showed that public television, among all program sources, is the most used by teachers in the classroom. Quite frankly, if public television stations didn't exist, we would have to create them as an educational resource for every community—to help communities use video and all the other technologies available for education.

During the hearing we chose to demonstrate the Media Fusion project—a partnership between Thomas Jefferson Jr. High School in Washington, D.C., PBS, WETA and Apple Computer Inc.—to demonstrate what may not be widely known: that public television is not just a broadcast signal. It is more accurately described as a local telecommunications center, providing educational services through a vast array of technologies designed to best fit the needs of schools and learners. Due to the enormous capacity of new technologies to provide universal access to educational and in-

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structional programming—access which breaks down the barriers of geography, income, disability and race—public television is reemphasizing its mission and finding that its true identity is recognized as the same as when it began over 40 years ago as Educational Television.

The Media Fusion project is not direct broadcast. Rather it is a combination of computer, PBS VSAT technology and satellite transmission. This unique integrated technology has enabled PBS to "reversion" The MacNeil/Lehrer NewsHour for instructional use in the classroom. Students are able to view the NewsHour on the computer and to highlight particular points for further discussion. The computer segment is connected to an interactive database that allows students to construct graphs and charts which illustrate their knowledge and understanding of the issues. Students then create text and video notes stored on the computer to share with each other or to send over satellite to their partner school.

This interactive use of television and technology is a far cry from passive instruction. Rather, it encourages students to become actively engaged in their own learning and to take some initiative for their own education. The power of the medium—visualization—is a significant motivational factor in igniting a student's interest in learning. This integration of computer and television is being used extensively in other educational programming. For example, Thirteen /WNET, New York will soon launch an interactive simulated safari series teaching geography, inquiry, science, history and social studies. WGBH has developed a Columbus 1492 series, which through a combination of video, data and text, combines instruction in history, geography, social studies and humanities.

This integrated technology offers an advanced approach to learning. But it is just the beginning of a technology revolution which will greatly transform the way we think about teaching and learning, dramatically change classroom practice, and facilitate a sharing of resources that will help to alleviate the disparity of financing among schools. It is another successful example of how technological advances can, and should, be converted or adapted for educational purposes.

In addition to Media Fusion, public television is bringing its programming and advanced technology to bear on classroom practice in a whole series of initiatives. At the end of this year, PBS will launch its Telstar 401 satellite. This satellite, supported by Congress, has the overwhelming capacity to provide close to 80 dedicated channels for educational purposes.

PUBLIC TELEVISION STATIONS ARE VALUABLE COMMUNITY PROBLEM-SOLVING PARTNERS

Here are but a few examples of what public television is doing in education:

Contributing to math and science competency. Public television is training teachers in new methods of presenting math and science content and giving them access to a whole new generation of video programs designed to meet national goals for the year 2000. Through partnerships between public television state networks and chief state school officers, math and science courses are being delivered via satellite to students in districts that could not offer them otherwise.

PBS has announced that it will soon launch Math Line, a service that will be the first telecommunications system devoted to improving the math achievement of American students. The service will include video, data and voice communication systems for teachers, students–and parents. PBS is working with the National Council of Teachers of Mathematics to implement the new NCTM curriculum and teaching standards by enrolling teachers in a year- long structured training program designed to help them implement the standards in their classroom. We hope that this will serve as a blueprint for similar future dedicated channels in other core subject areas.

In Ohio, WNEO/WEAO (Youngstown and Akron, Ohio) are working with the University of Akron, Kent State University and Youngstown State University to help schools in 16 Ohio counties to implement the state's new mathematics curriculum. Math Movers, funded by the Ohio Department of Education, uses a unique teachers-training-teachers approach in which master teachers on television guide classes through an activity while demonstrating instructional techniques to the teacher. At a follow-up teleconference, teachers can evaluate their performance and ask questions.

Teacher Training. Public TV organizations at the local, regional and national levels are devoting significant resources to providing teachers with inservice training, access to experts and the information that is needed to put educational reforms into practice in the classroom. Satellites are helping to reach large numbers of educators in cost-effective ways. For example:

The Satellite Educational Resources Consortium, Inc. (SERC), a partnership of departments of education and public broadcasting networks in 28 states, offers teachers a number of distance learning opportunities to brush up their skills and gain graduate credit.

WNET in New York in partnership with Texaco, Inc. established The National Teacher Training Institute for Science, Television and Technology to train elementary, middle and secondary school teachers how to teach with instructional television. To date, the institute has trained more than 17,000 teachers.

Promoting School Equalization.. Public television has the power to break down the traditional barriers of school walls, by bringing high quality educational instruction to all schools. It offers a highly cost-effective means of promoting equality among school systems via universal access, thus helping to solve one of the toughest educational policy challenges faced by many states throughout the country. Kentucky is an excellent example of where this has been demonstrated effectively. Faced by court order to meet school equalization requirements, Kentucky's legislature was desperate for a plan that would satisfy the court, but not bankrupt the state. It turned to Kentucky Educational Television (KET) for help, asking the public television experts to find a telecommunications solution to the problem. KET proposed a distance learning system. The state then installed a satellite dish in all 1,600 schools in the state. Now students in isolated and disadvantaged schools are taking the same courses in German, Latin, advanced math, and physics as their peers in wealthier school districts.

Enhancing educational use of technology. Public television adapts new technologies for educational use, making them accessible to schools, teachers and learners. In addition, we create programs that expand the use of interactive educational technologies and train teachers to use these new technologies effectively. Some examples include:

PBS ONLINE, a nationwide, two-way interactive data telecommunications network providing educational services to schools, colleges, universities, businesses, libraries and homes. Expansion plans for PBS ONLINE include providing multimedia services (combining video, graphics, and photographs) in addition to data services.

PBS ONLINE provides teachers, students and parents with curriculum-based resources and communications tools. It offers supplementary services to public television's instructional television programming, which include "stand-alone" instructional material that supports in-school and at-home educational activities. Professional development services are also provided to teachers and other professional educators.

Managed by PBS in conjunction with public television stations throughout the nation, PBS ONLINE offers a powerful, two-way interactive data distribution system providing online access to a multitude of products and services; databases, managed forums, bulletin boards, special projects, electronic mail and an electronic student magazine.

Current services include:

PBS Learning Link, a dynamic curriculum tool and professional resource for kindergarten through 12th grade teachers and students. PBS Learning Link is the nation's largest non-profit educational online service for teachers and students. The system merges the strengths of nationally respected organizations with local or regional resources of expertise.

What many do not know is that PBS Learning Link provides teachers and students access to INTERNET as well as other forms of information services and electronic mail.

Services in Development include:

PBS Math Line mentioned above; a Ready to Learn ONLINE to be used in conjunction with the development of a national Ready to Learn video service for preschoolers, parents and childcare workers; and a PBS Program Segment Library enabling teachers to research and preview topic specific programs that will enhance or supplement specific curriculum units. Programs can then be delivered by video cassette, directly off satellite, or over-the-air from local public television stations, and ultimately directly to the teacher's computer disk.

Ongoing Educational Technology Projects are offered throughout the country by local public telecommunications centers, such as:

In Massachusetts, WGBH On-Line offers an Educators' Conference for specific programs or subject areas. WGBH also created "interactive NOVA", a multi-

media education computer program which WGBH has been using in state schools.

In Vermont, Vermont ETV serves over 93,000 students in more than 400 schools through access to more than 1,000 instructional television programs. In addition, Vermont ETV maintains a television library service for teachers who cannot use programs when they are aired, or for schools with poor reception.

In Illinois, WYCC is one of the handful of public television stations whose programming is entirely instructional. All of the stations' broadcasts consist of telecourses for college and GED credit, English as a Second Language, literacy training, remedial math or instruction for children.

In New Mexico, KNME, co-licensed by the University of New Mexico and the Albuquerque Public Schools, devotes 51 percent of its programming to general education.

In Iowa, responding to its educational needs, the state called upon Iowa Public Television (IPTV) to organize and operate a statewide educational telecommunications network. Iowa has become a national leader in interactive telecommunications by taking advantage of the public television infrastructure already in place. The Iowa Distance Education Alliance received a $4 million Star Schools grant in 1992 to implement distance learning plans including curriculum development, teacher training, public information and other activities. K-12 teachers throughout the state regularly incorporate parts of a full school day's worth of instructional programming provided by IPTV. The network has also assisted Iowa schools in setting up telecommunications systems.

In South Carolina, South Carolina Educational Television (SCETV) established an extensive statewide closed-circuit television network for the schools as early as 1960. Late this year, it will begin operating an extensive satellite system that will greatly expand the educational opportunities now available through SCETV. Over 83 percent of South Carolina public school students view instructional television. South Carolina's 20,000 teachers select from over 245 educational series, many produced by SCETV. SCETV also provides staff development programming for teachers, administrators, aides, custodians and district staff.

In Mississippi, the Mississippi Educational Network operates Mississippi 2000, a distance learning pilot project that uses a fiber optic network to link the Mississippi Educational Network with four high schools and two universities, and various other distance learning projects offer a total of 30 courses in 151 schools.

These stories serve as highlighted examples of what is happening in communities and states across the country—strong working partnerships between public television and school systems to make the highest quality education accessible to all students. In fact in 24 states, public television stations are either state owned or operated, in large part devoted to educational purposes. In short, public television's story is so much more than Big Bird and Masterpiece Theater.

PUBLIC TELEVISION IS FOR EVERYONE

The education projects developed by these partnerships are different in each community, tailored to the specific needs of schools and educators in each service area. In addition, they are "technology neutral" building upon, or bridging with, the existing telecommunications technology and infrastructure of each community.

Recommendations:

As a result of all this activity nationwide, public television has gleaned important experiential knowledge which we believe can help to strengthen your legislation as it moves through the Committee. Specifically, we offer the following:

1. Planning. We greatly applaud the planning provisions in your legislation, specifically in Section 202 of Title II. Developing technology systems for classroom use is an expensive proposition. Extensive planning must precede purchase of equipment and implementation of activities. Careful consideration and analysis must be given toward identifying and subsequently investing in systems which are fully interactive with other information systems, which can be most adaptive to future breakthroughs in technology, and which fit specific school needs in the area. The most expensive equipment in the world will not promote educational improvement unless it directly addresses the needs of the students and teachers who will be using it.

America's Public Television Stations strongly support S. 1040's language which makes public telecommunications entities a partner in this planning process. It is particularly important that schools have access to the technical expertise and expe-

rience available from a local public telecommunications center. Public television is "technology neutral". It delivers its instructional programs via a broad range of technologies. It can adapt to any communications system—be it satellite, twisted copper, cable, fiber, VSAT, CD-ROM or digital compression. How information is delivered to a school is largely based on school budgets and existing communications resources in the community. Public television offers schools the kind of neutral advice that will enable them to make prudent selections among a vast array of dazzling technologies. Few schools have the necessary in-house technical expertise to make these decisions. Public television offers the kind of technical assistance that will enable school systems to wade through this plethora of products, and chose a system that will best fit their own needs—and their budgets. We believe this planning process could be further strengthened by continuing the planning partnership through ongoing technical assistance once the technology is implemented in the school.

2. Access & Equity. One of the greatest advantages of technology is that it can promote access and equity in a highly cost-effective manner. This is because its reach is extensive, and in the case of public television, universal. The example of Kentucky's reliance on public television's distance learning to solve their school equalization problem proves this point. However, as the federal government invests in school technology, every effort must be made to insure that it will serve all students, particularly needy populations. Federal investments in information systems must result in universal access to high quality. There is a great danger that federal grants could serve to exacerbate, rather than relieve, the inequity of resources among school districts by failing to be sensitive to equity needs in the grant-making process. Again, we believe that public television offers the best method for solving this riddle, as its broadcast signal reaches 98 percent of all American homes.

3. Build Upon Existing Resources. S. 1040 represents a sizable, but critical, investment of federal dollars. It is important to recognize that Congress has already made a considerable investment in our public telecommunications infrastructure. For example, on top of the $4 billion already invested in the nation's public broadcasting infrastructure, Congress provided $150 million for the deployment of Telstar 401, the PBS educational satellite. In addition, federal funding through the Corporation for Public Broadcasting provides on average 16 percent of financial support for local stations, and more than double that in rural areas. These federal incentive funds attract another $5 for every $1 of federal monies, much of which are invested in local educational services. In the interest of wise public policy, it is therefore important that these new dollars be used to build upon, rather than duplicate, what the federal government has already supported and is currently in place. We therefore recommend that every effort is made in the legislative language of S. 1040 to see that programs funded through this Act support projects which bridge existing noncommercial public telecommunications services, and that they not be used to duplicate what is currently in place. The last thing we need is a whole series of duplicative systems which cannot speak to each other.

5. Teacher Training and Ancillary Services. We have found that this is the critical factor for insuring that technology actually promotes learning rather than becoming a tool unto itself. We know this Committee well remembers the experience of the National Defense Education Act, its legislative response to the launching of Sputnik over 25 years ago. That Act supported purchase of state-of-the-art equipment for the classroom which at that time was a television set. However, when the evaluators came to examine the effectiveness of the program, they found many of the television sets hidden away in the closet. The problem was that everyone forgot that without adequate teacher training to integrate the television into classroom practice, it offered little educational utility.

Teacher training is an integral element of public television's involvement in education. Public television's education partnerships not only provide teacher training in the use of technology, they also offer opportunities for ongoing professional development and interaction with colleagues. In addition, public television provides support materials and training manuals which will enhance use of its educational products both in the classroom and at home. It is one more example of the enormous resources that local telecommunications centers provide to local schools and school systems. We therefore strongly urge you to specifically mention partnerships between public telecommunications entities and local schools, LEAs or SEAs as eligible recipients of funds under Section 204 of Title II; Section 303 of Title III; and Section 403 of Title IV. While it is true that nothing in the legislation would preclude them from applying, specific language would give a clear legislative signal that these kinds of partnerships are an appropriate and ideal use of the federal dollar under this Act. Without such language, we are greatly concerned that these public television partnerships will be ignored in the regulatory and competitive grant-making process.

The legislation you have introduced is powerful, moving schools in a direction that is long overdue. We offer our recommendations not as criticism, but as carefully developed suggestions for strengthening what you have introduced so that schools may best be served by the provisions contained in S. 1040. We hope that you will give our recommendations serious consideration as you move your legislation through the Congress. We hope as well that you will recognize the vast degree of commitment and experience public television has had in facilitating the use of technology to promote learning, and thereby acknowledge the advantages of continuing the strong role that public television should play in improving education nationwide by expanding the partnership provisions between public television and schools, LEAs and SEAs in your legislation.

Senator BINGAMAN. OK, fine.

Lateef, did you have anything to add about what this project involved, or anything else you are doing that is related to this?

Mr. ABNEY. I did want to add that the problem with the database was that we had our own glossary which would tell us the definitions of what the chart would turn out to be, so if we wanted to compare something like GNP to CFC in 1989, we had to show we knew what it was and what function it would do to help us out. So we would have to take time—instead of just making a chart, we had to think about whether what the chart is going to show is going to be of any relevance to what the topic is.

And my mistake was that in my glossary, the GNP definition was a mistake, and the people at Davidson were confused, and they did not understand what I was trying to compare, because it did not make any sense. So it was good that they came back and corrected me, and I corrected myself, because it had no relevance to what we were talking about with the greenhouse effect.

Senator BINGAMAN. That's great. Now, you did this project as part of your science class, is that right—which class was it?

Mr. JOHNSON. This was actually a research and development effort that they gave up their lunchtimes for——

Senator BINGAMAN. Oh, I see. You didn't even get class credit for this.

Mr. ABNEY. No. We gave up recess, lunch, and after school most of the time we stayed until 6:00.

Senator BINGAMAN. That's terrific, a very impressive operation.

Go ahead, Jacqueline. Do you want to tell us about your involvement in this?

Ms. FISHER. Yes, but first I wanted to say that when you asked what class is this—I don't think you can actually say it was science class or math class, because it is a combination of math, science, computer, and all of those are skills that we need for the future. So I don't think there is a class that you can label it into.

Also, as far as not getting any class credit for it, it all depends on how you look at it, because these are credits that we would get that are not so much on paper, but are in our minds, that will turn out to be wonderful pieces of information when we get out into the work force in the future. If you look at the classifieds today, almost all of them require computer experience, so getting this now is much better than when you are older, 30-some years old—well, older than what I am right now—because when you get older, it becomes hard to change. [Laughter.]

Senator BINGAMAN. I think that's right. I find that myself. You get over 30, and you are pretty much over the hill. [Laughter.]

Ms. FISHER. Also, I would like to say that this is one of the best things that you can have, because with the databases, you can pick what you want to find out. You can ask yourself questions that you want to know, and then you can find things to back it up without looking in the textbook or anything like that, because I feel that if more kids had this kind of learning tool today, then I think more kids would be in school. We do have a high dropout rate, and I think a lot of kids think school is boring, but these kinds of things change it so it is not boring anymore, and it enables you to do so many different things.

Senator BINGAMAN. That sounds terrific.

How many students in the Jefferson Junior High School are getting to participate in this kind of activity right now?

Mr. JOHNSON. In terms of the media fusion project?

Senator BINGAMAN. Yes.

Mr. JOHNSON. It being a research and development tool, the experimenters at Apple asked us to keep the number down to about 15 right now, just so they can build credibility for the information they are getting relative to this being a viable learning tool. But we completed the second phase of the user study June 12th, and we are still waiting for the papers to be written. There is also an accompanying videotape to what we have been doing that I think at some point is going to be submitted as part of the official testimony to undergird some of the things you have seen here.

Senator BINGAMAN. So you hope that you can demonstrate this for use by a lot of classes.

Mr. JOHNSON. Yes. Actually, Apple made the mistake of giving me all the hardware and the software, and I have already started incorporating this into my lessons for the fall.

Mr. ABNEY. One thing I wanted to say was that, besides myself and Jacqueline learning, also there were a couple other children, and there were other people who also wanted to get the experience, but unfortunately were not able to use the software. Through this, hopefully, we can be part of the future of education. Actually, right now, we are changing the way children will be learning, and also the other children who work with us also learned, too, so it was like a group effort because we didn't all just do one thing. Everybody had something they had to do. And that was the hard part, to get along with your friends, and teamwork. It taught you how to use new technologies.

So this doesn't just give you the computer. It gives you new technology, it teaches you teamwork, it teaches you what kinds of futuristic things will be happening, and hopefully, it might be installed in classrooms all across America and the world, so we can keep in touch with and learn new cultures, new ways of living, and all kinds of things.

Senator BINGAMAN. I think that's great, and I appreciate knowing about this program.

Mr. JOHNSON. Thank you for allowing us to speak.

One addendum. I think the real beauty of what is happening with this particular piece of technology is the fact that they are actually given a form to build those high order, critical reasoning skills that we have gotten away from in education, and it does it in a very nonthreatening and very supportive sort of medium.

Thank you for your time.

Senator BINGAMAN. Thank you very much. We appreciate it.

I just got a note here that I am fouling this up by asking questions as we go, so why don't we have the other two demonstrations, and then I'll ask questions at the end.

Next, we are going to see a demonstration coordinated through the Software Publishers Association. John Kernan, who is chairman of Jostens Learning Corporation, will introduce three demonstrations from IBM EduQuest, Apple Systems, and Compton's Multimedia Encyclopedia, with the assistance of Gerry Caldwell, who is with the EduQuest marketing programs and support director, and Jeff Orloff, who is the manager of national programs marketing for Apple.

Gentlemen, why don't you go right ahead?

Mr. KERNAN. Thank you, Mr. Chairman.

I am the president of the Software Publishers Association, which is the Nation's trade association for the personal computer software industry, and I am also the chairman of Jostens Learning, which is the largest educational software publisher.

Mr. Chairman, we want to commend you and the members of the committee for Senate bill 1040. This bill deals with three important issues in technology in schools. The first issue is the funding, and the provision of Federal guarantees for low-interest loans will really help to further the deployment of technology in schools.

The second thing you have done well in this bill is to focus on technology planning. And perhaps the biggest thing that this bill focuses on, and others have said it here, is teacher training, which is critical for the effective use of these technologies.

But from the software industry's point of view, we are concerned about S. 1040's emphasis on a single software standard for schools. We think that this would limit the creativity that you are going to see in the programs that are demonstrated today. I have been in the software business 25 years, and I believe that any standard that we would develop would be obsolete long before it is ever deployed to schools.

So let's take a look at some demonstrations. The first one is a product from our company, Jostens Learning. It is the Compton's Multimedia Encyclopedia, which is a complete 26-volume encyclopedia on a compact disk.

Let's use the encyclopedia like a student would. The first exercise that this student is doing is a science paper on the human heart. [VIDEOTAPE SHOWN]

Mr. KERNAN. We search the entire encyclopedia and find the article on the heart. The cameras are pictures, and the little movie cameras are animation. Now students can see how the heart works. That article has 31 pages.

Now let's say a student was doing a history paper on Dr. Martin Luther King. This encyclopedia has a time line of U.S. history, and you can go through the time line. We have gone through it and gone back to 1968, and we are calling up Martin Luther King, and we can listen to his speeches. Most of the kids in school today were born after that speech was delivered.

And finally, let's say the student wanted to do a social studies paper and was interested in the U.S. Senate. I'll be that is in the

encyclopedia. There are apparently a lot of "Senates" in the encyclopedia, so we'll look at the one for the United States. Here is the one we want. We can call up the article, and there it is. A student can even open a word processor and begin taking notes from the encyclopedia, and the student has started to do that here: "I like the Senate almost as much as MTV."

Senator BINGAMAN. That's hard to believe. [Laughter.]

Mr. KERNAN. Mr. Chairman, Jostens Learning has installed this product in thousands of schools, on tens of thousands of work stations, and there is a consumer version that is available for you to use at home that is sold by Encyclopedia Britannica.

And Mr. Chairman, you might also be interested in the fact that this all-electronic product was just adopted in the State of New Mexico as an official textbook. This is a copy of New Mexico's latest textbook, the electronic Compton's Encyclopedia. Forty kids can read the textbook at the same time, and we update it every year.

I will now turn it over to Gerry Caldwell from IBM EduQuest.

[The prepared statement of Mr. Kernan follows:]

PREPARED STATEMENT OF JOHN KERNAN

Mr. Chairman, members of the Committee, I am delighted to have the opportunity to speak to you today about a subject that is near and dear to my heart—getting students excited about learning by integrating technology in the classroom. My name is John Kernan, and I appear before you today wearing two hats. First, I appear before you as the President of the Software Publishers Association (SPA), the principal trade association of the personal computer software industry. The SPA has over 1000 members comprised of large and small software publishers and developers in the education, business and consumer software markets worldwide. Many of these companies are involved in the publishing or distribution of educational software for the K-12, home and higher education markets. These include such well-known companies as Apple Computer, Davidson and Associates, Broderbund Software, EduQuest, Edmark, GeoWorks, Jostens Learning Corporation, Learningways, Macmillan/McGraw Hill, MECC, Novell, South-Western Publishing, and The Learning Company. A complete list of our education members divided by their home states is attached as Exhibit 1 to my testimony.

Second, I appear before you as the Chairman of Jostens Learning Corporation, the largest supplier of educational software and the largest CD-ROM publisher in the world. I helped start Jostens Learning Corporation in 1985. Since that time we have grown from a handful of people to nearly 2,000 employees.

With me today to share our experiences of providing education technology to schools and to answer any questions you may have are representatives from two other SPA member companies, W.H. Gerald (Jerry) Caldwell, Jr., the Director of Marketing Programs and Support at EduQuest, an IBM company, and Dr. Jeffrey Orloff, Manager of National Education Markets for Apple Computer, Inc.

Mr. Chairman, we want to commend you and the other members of this Committee for the leadership you have shown in producing S. 1040, a bill which is vitally needed to provide all students with access to modern learning technologies. As you are aware, for many children, traditional American schooling is a painful and difficult experience. While their world outside the classroom is awash in electronic media, inside the classroom they often find only chalk and paper. Deprived of engaging stimuli, many children quickly lose interest in schooling.

But this needn't be the case. Today there are many high quality curriculum software programs that use the same technologies that have turned kids on to Nintendo and MTV. They're designed to grab students' attention and make learning fun. Impressive achievement gains at schools equipped with such software programs provide compelling proof that use of technology in schools can help students develop the critical thinking skills they need to meet the challenges of the 21st century. Details of how the use of technology can help students to learn at a faster rate, feel better about their work, and interact more productively with their teachers, are set forth in this report on "The Effectiveness of Technology in Schools 1990-92", which was commissioned by the SPA and conducted by an independent educational technology consulting firm, Interactive Educational Systems Design, Inc. Mr. Chairman,

BEST COPY AVAILABLE

I would like to leave you and the other members of this Committee with copies of this report.

The SPA believes that it is crucial that schools be provided with a range of software choices, and indeed, SPA companies offer an abundance of quality software that run on appropriate hardware. Yet a well-developed, technology enhanced curriculum remains out of reach for many schools and teachers. The problem for schools is threefold:

1) Financing. Not every school can afford the technology they need to educate their student. S. 1040 addresses this concern by providing low-interest loans for state and local education agencies to acquire education technologies under the "Connie Lee" program, which is administered by the College Construction Loan Insurance Association.

2) Comprehensive technology planning. In many schools, what passes for a technology plan resembles a house built by a committee without a leader. Our experience suggests that merely putting computers in classrooms does not mean that they will be used effectively. Successful computer integration requires several key components. These relate to curriculum materials, teacher training and support, the classroom environment, parent involvement and research and assessment. S. 1040 addresses this also.

3) Staff development. Without adequate staff training, technology will not be integrated into the fiber of classroom activities. Providing teachers with computer software but not with appropriate staff training is like giving them a textbook with blank pages. Yet many schools give short shrift to staff development. This issue is also addressed by S. 1040.

The creation of an Assistant Secretary for Technology within the Department of Education is a key element of this bill: Such leadership is necessary to manage the technology infrastructure support programs, to ensure that technology is distributed to all school districts so that no student is disadvantaged, and to advise and coordinate federal programs on uses of technology in education. Although other offices in the Department of Education touch upon education technology issues, their missions are not directly related to education technology as an important instructional material. They do not have the mandate or the resources to give education technology the attention it needs. Technology in education is a national priority. Thus, a Federal office exclusively for that purpose is appropriate and essential.

Also important is the development of strong partnerships among industry, the federal government and education agencies. Many of the success stories that SPA's education software publishers report are due in large part to the fact that industry has listened to educators' needs, and have stood by them to make sure that teachers are adequately trained and supported, and that the programs meet the needs of their curriculum. Attached as Exhibit 2 is a variety of examples of industry and education partnerships that have produced improved student learning through the use of technology.

Although this bill is a badly needed vehicle for giving all American students the technology based skills they need to become the workers of the future, I must caution the Committee on certain presumptions in the bill that could undermine this noble purpose. S. 1040 appears to contain a presumption in favor of setting a single standard for educational hardware and software. We believe that standard setting in this area is completely inappropriate for the following five reasons:

(1) Standards set by the government will render existing systems obsolete, undermining the investments in equipment and training already made by school systems. There is no need to mandate the reinvention of the wheel, and we must not limit the ability of school systems to get the maximum use out of the technology they already have.

(2) The choices schools make in their purchases of education technology depend on many factors that school personnel are best qualified to assess. The Federal government should not make those choices. It does not choose textbooks, and it should not standardize choices in education technology either.

(3) Standards result in a decline in competition in industry, which leads to higher monopoly prices. This bill seeks to make education technology more available to schools. Driving up price is contrary to that goal.

(4) Competition will lead to better and more cost-effective products. The computer and software industry are intensely competitive. That competition has just in the past year resulted in the introduction of many technologically advanced products at prices that are lower than the products they are designed to replace. In our industry, prices have been going down, enabling schools to significantly stretch their education technology dollars.

(5) Standards are simply impracticable and impossible. This is still a young and growing industry. It would be virtually impossible to establish a timely standard.

My 25 years plus in this business tells me that by the time all the key players agree to a single standard, the technology would already be light-years ahead, thus rendering the standard obsolete and useless. We need to promote creativity, not prohibit it.

In sum, the presumption for a single standard that pervades this legislation is unprecedented in the United States, and ultimately would be adverse to the interests of the school systems the bill is designed to help. But enough said. A picture is worth a thousand words, and it is now time for me and my colleagues to demonstrate some of the wonderful products and programs available to schools to make education come alive for students.

Mr. Chairman, education is the cornerstone of our nation's global competitiveness, and today, technology is its driving force. With a responsible, carefully crafted S. 1040, millions of children in schools will have new opportunities to learn and succeed through the systematic integration of technology into all schools in the United States. We salute you for your efforts. Thank you.

[Additional material is retained in committee files.]

Senator BINGAMAN. OK. Thank you.

Mr. CALDWELL. Senator, one of the main points I would like to emphasize that was brought out in the earlier testimony is that if you look at applications of technology in education as they have evolved and improved over time, they have gone from initially sort of mechanizing existing processes—for example, drill and practice; the technology could help do that. But now it has actually gone to where new processes undergirded by technology can be accomplished. I think the prime one is this is point that has been mentioned about actually changing the classroom model, and in that new model, the key point is that the student is being engaged, the student is the worker. The student naturally has an affinity for technology and will put more mind on task in this role. The teacher's role has changed to be more of the guide or manager of the process, which many teachers think is the most professional role that they can do.

So I think that is an extremely key point, and of course, making this work would be the software that is designed for this integration into the direct classroom, as well as the training so that the teacher is comfortable with it.

There are thousands of classrooms in this country that have made that transition, and it is working, and the results are really indisputable at this point.

I want to show you today an application with multimedia to show how it can engage students. This happens to be a book we call "Illuminated Books and Manuscripts," and what I am going to show you is a little bit of a classic work, the poem "Ulysses," written by Tennyson. It happens to be written about 130 years ago, and it is a poem, so it would not be natural turn-on to kids today, but it is a classic.

You'll see here the text, and I will just have a chance to illustrate some of the things. But let me hit "Interpret," and you'll have a choice. I am going to click on "Seeing," and then it will illuminate this particular passage on the son. And by clicking on that, I'll get a list of people who could read this to us, Shakespearean actors and so on, who can do a very professional job. So I am going to bring Mr. Revill into the classroom and ask him to read to the class today this passage. [VIDEOTAPE SHOWN]

Mr. CALDWELL. I'll click that off, because I think you get the feeling. But obviously, the power of having the very best come into the classroom is very, very popular.

Now let me show you another capability. I'll click "Seeing," and this time, "Interpret." We might want to get an expert to give us an interpretation of this. So once again, I'll get a menu of real experts in the field. In this case, I'll click on Nicki Giovanni, who is a Poet Laureate, and get her thoughts on what does this particular passage mean. [VIDEOTAPE SHOWN]

Mr. CALDWELL. Again, we could go on further, but I want to finally show you just a little bit of the power of this. In this case, what I'd like to show you is—think of this as a student project—I mentioned having the students actually involved—think of this as we want to get a group of students to kind of show us a synopsis of what this poet meant to them. They worked on it, and they used the tool of multimedia to produce this. So we are going to give you a little bit of this. This is the students' work of what does this poem mean. This poem is about heroes, villains, issues of the day. So think of this as a powerful little piece that students put together expressing what this poem means to them in summary. [VIDEOTAPE SHOWN]

Mr. CALDWELL. I think you'd agree those students were engaged in their learning, and the power of that shows through.

Senator BINGAMAN. Yes. That was very impressive.

Mr. CALDWELL. If any of your committee would like to see that or see more of this kind of thing, the Library of Congress has this sort of equipment available, and they could visit and really explore this more at length.

Thank you.

Senator BINGAMAN. Thank you very much. That was very moving, no question.

Mr. Orloff.

Mr. ORLOFF. Thank you, Senator.

I am going to take you for a few minutes to the other end of the student's life to the preschool children aged 3 to 5 years old and show you some software programs and a screen interface that have been developed for children of that age.

I am going to be showing you one that explores the area of mathematics and one in language arts. But the first that I am showing you is a screen that makes it a little easier for a very young child to use the computer. It uses a software program developed by Apple Computer called "At Ease." You will notice there are only six buttons or icons on the screen. They are animated, and for those students who cannot read, if they just move their "mouse" over to the button, it tells them what the name of the program is in a child's voice to make them feel much more comfortable.

We find that programs for young children need to be interactive in nature, because they need to require the child to be proactive. And in fact, you will find these quite engaging, and they actually ask the student to participate in a very, very powerful way. So let's take a look at two.

The first one I am going to show you is from EdMark Software Company, located in the State of Washington, and it is called, "Millie's Math House." [VIDEOTAPE SHOWN]

Mr. ORLOFF. With most preschool software programs, you will find extensive use of sound, music and graphics. So what we have here are a number of exercises for students in discovery areas, and

I'm going to pick on just a couple. The first one I am going to pick on is the one in my upper left-hand corner.

I am going to click on one of these characters. "Big" says, "I need shoes." So you have to go over to the shoe rack and pick a pair of shoes that meet the needs of "Big." I am going to take a medium pair of shoes and see what happens. He doesn't look too happy. I am going to pick a small pair now. Then, when I pick the big pair of shoes, look at how pleased "Big" is.

Now I am going to click on an activity called "Build a Bug." Again, it requires the student to be a participant. In this case, you actually put a bug together. I am going to select a face—and now I have to fill in the bug with a variety of body parts. Students learn by using this that a number, in the case of the number 3, really means a quantity of something, not just a number. So let's select eyes, and we'll give the bug three eyes. And let's give it ten feet. At this point, I can print this by just clicking on this icon, and I will get a page that I can then color in; I can write a story underneath or whatever I'd like to do.

You will notice in the bottom right-hand corner, there is a little icon which provides additional information for teachers in school, or parents at home, on the way this program can be helpful in working with their young children.

The next program I am going to show you is called "Living Books," from Broderbund, a California company. What Broderbund has tried to do here is to make books actually come alive. I think you'll really enjoy this.

One of the unique aspects of this program is that given that more and more schools across the country are entering students who speak a variety of foreign languages, this program comes in such a format that you can choose to see it either in English, in Japanese, or in Spanish. In this demonstration version, what I will show you is two pages, one in English and then one in Japanese.

Now we go to the first page of the story. [VIDEOTAPE SHOWN]

Mr. ORLOFF. So the book reads to the student; we get some animation, and what we end up with is a page that is quite interactive. I can make any number of things happen just by clicking on a variety of areas. For instance, I am going to click on this flower right here. [Pause.] Or the mailbox; a frog jumps out. And one of my particular favorites is this fence.

What we are going to do now is go to the next page, where we will end up on a beach, where Japanese is the language. The bus pulls up at the beach, and again, this story will go through a number of activities, and the student can participate by clicking on a number of areas.

So what we have seen here are a couple of software programs aimed at preschoolers, one dealing in mathematics and one dealing in language arts; very interactive in nature and requiring our students to be quite proactive in their learning.

Thank you very much.

Senator BINGAMAN. Thank you very much. That is very impressive.

Our last demonstration is Rick Lane, who is co-founder of the Modern Educational Technology Center; and Michael Swetnam, who is the director of GTE Information Processing systems. And to

introduce a demonstration called "GTE Kiosk System," we have a student-teacher team of Valerie Thames and Audrey Hillman

Rick, why don't you go right ahead?

Mr. LANE. My name is Rick Lane, and I am co-founder, along with David Rosenblatt, who is also here today, of the Modern Educational Technology Center, Inc. On behalf of our organization, we would like to thank the committee for giving us the opportunity to testify in support of this important legislation.

METEC is a nonprofit corporation located in Montgomery County, MD. It was created to help ensure the best education available for Montgomery County students by assisting in the coordination of parent-school-business partnerships involving educational technology.

Our written testimony will provide the committee with a unique perspective on the Technology for Education Act of 1993. It will furnish the committee with a representative model of an educational private-public partnership specifically designed to help facilitate the implementation of educational technology initiatives. The testimony is based no our experiences of developing an entity from the grassroots, the successes we have had, and the obstacles we have had to overcome.

The primary message that the testimony delivers is that S. 1040 will benefit both the local school district and its students and will encourage more educational public-private partnerships similar to METEC.

We are here today testifying with one of our founding corporate members because we, too, believe that Federal commitment and leadership is vital for the success of METEC's goals and those of partnerships like ours, as well as for the successful implementation of local educational technology plans throughout the country. This is why METEC strongly supports S. 1040, the Technology for Education Act of 1993.

I would like to now introduce Mike Swetnam, director of GTE Government Systems, representing one of our corporate founders.

Mr. SWETNAM. Thank you, Mr. Chairman, for giving us the time to appear in front of you.

Senator BINGAMAN. I am glad you are here. Go right ahead.

Mr. SWETNAM. As you know, GTE Government Systems has been a prime developer of advanced communications and intelligence systems for the United States Government for almost 30 years. During that time, we have been involved with some of the most advanced technology that the Federal Government has sponsored anywhere.

Over the last year, we have been endeavoring to utilize that extensive background in communications and intelligence and technology in other challenges in our society, and in particular in education.

We are going to show you today a short demonstration of a system called "Kiosk," a multimedia classroom which is based upon technology that was actually developed for the intelligence community to present multimedia briefings in the White House for the President. If you will, we are transitioning technology from the White House to the school house.

We have with us today, as you mentioned, Valerie Thames and Audrey Hillman, who will present to you a short, multimedia lesson that they actually developed using the Kiosk system over the last 24 hours, and hopefully it will incorporate a little bit of this hearing in it.

Valerie?

Ms. THAMES. Today, we are going to be learning about our Government, and we are going to start by looking at some pictures. [VIDEOTAPE SHOWN]

This is a picture of our White House. This is a picture of our U.S. Supreme Court. What is this a picture of?

Ms. HILLMAN. The Capitol.

Ms. THAMES. Do you know what happens at the Capitol?

Ms. HILLMAN. No.

Ms. THAMES. Well, let's go and find out. Here, we see the Capitol. Tell me about your picture here.

Ms. HILLMAN. This is my mommy, and this is my daddy.

Ms. THAMES. Come on up here and show me mommy and daddy.

Ms. HILLMAN. This is mommy, and this is daddy.

Ms. THAMES. Do you know what happens there?

Ms. HILLMAN. No.

Ms. THAMES. Well, let's go and find out. Yesterday, we made our classroom rules. We did that by first discussing them, then voting on them. Let's take a look at what the Capitol does. Basically, we know that at the Capitol, they make rules, or what is known as law.

Let's take a look in today's paper and find out what is happening. We can see that they are working on education, my favorite topic. Let's go live there and find out what is happening. [VIDEOTAPE SHOWN]

This was taped this morning, and these are the people who are going to help to make our classrooms a better place.

Thank you.

Mr. SWETNAM. Thank you, Valerie. Thank you, Audrey.

Mr. Chairman, that touch-screen interface was developed for very senior policymakers in the White House, and we find that it works very well in elementary schools as well. [Laughter.]

I would submit to you, sir, that today our classrooms are in the technological equivalent of the 1950's, and this will not change until you commit to invest in the technology of learning. Many in industry will experiment, and some will build big businesses around education, but not until the Government takes a leadership role will the full technological power of our industry be focused on this vital area.

The power of U.S. industry almost always follows the Federal Government on R and D spending. Isn't it time for an education version of "Star Wars," or a classroom-based version of the Manhattan Project? We believe that an awful lot more can be accomplished, some of what you have seen today, for very little money.

This is why we are very much supportive of S. 1040, which you have helped bring in front of the Congress today. It will establish research and development as a priority, and it will provide the funds that will ensure industrial participation. As a technological Nation, we have shown the world that no one can compete with our

Smart bombs, our Stealth aircraft, or our lightning-fast telecommunications systems. Let us now show the world that no one can compete with our high-technology, interactive, multimedia classrooms.

Thank you very much, sir.

[The prepared statement of Mr. Swetnam follows:]

PREPARED STATEMENT OF MICHAEL SWETNAM

Good morning Senators. I am Mike Swetnam the Director of Information Processing systems at GTE Government Systems Corporation. It is my pleasure to present a short demonstration of GTE's concept of the "Classroom of the Future".

GTE Government Systems has been a prime developer of advanced communications and intelligence systems for the US government for almost thirty years. During that time we have been associated with the most advanced technology available in the world. We were a proud partner in the successful Cold War struggle. We are now attempting to utilize our extensive experience and technological resources to address the other challenges within society. We are going to present a short demonstration today of a multimedia classroom system called Kiosk. The system utilizes technology originally developed to support US intelligence briefings in the White House. We refer to this transfer of technology as going from the White House to the school house.

The Kiosk system that you will see today incorporates a flexible touch screen interface designed for use by very senior policy makers. We find that it is also an ideal interface for the classroom. It is a system developed to rapidly access text, voice, and video data bases almost anywhere in the world and provide to the teacher or student the tools to manipulate, display, and interact with the data. This system is unique in that it incorporates a set of tools that allows teachers to build custom lessons from available multimedia data, allows students to interact with the data, and provides a new creative media for student expression. The system can also display canned multi-media lessons developed by other vendors, but it really shines as a teaching tool for the development and presentation of custom lessons designed by a local teaching staff.

The lesson demonstrated today incorporated data on the US Congress pulled from a video archive, scanned in by the teacher, and drawn on the screen by the student. Some of this data, including the Chairman's opening remarks, were added to the lesson just moments before my testimony.

These features were key developments incorporated to satisfy timeliness and use ability requirements of the US Intelligence Community. We believe that the incorporation of these technologies in classrooms is a small but worthy example of the concept of DOD technology transfer.

The system was adapted for classroom use through a cooperative arrangement with the Montgomery County Public School System in Maryland. The school system allowed GTE to deploy a prototype Kiosk system into a local elementary school and use the experiences of teachers and students, real users, to drive the continued development of a useful system.

This cooperative arrangement has led to the advanced development model that you see today. We hope to continue the development through to full commercial product deployment in late 1994.

GTE Government Systems Corporation firmly believes in a government leadership role in technology development and utilization. We witnessed the vast efforts in nuclear technology development that resulted from government priority in nuclear research. We participated in the massive development of intelligence systems as a result of government investment in the technology of data collection and processing for national security. And, we marveled at the significant advances in communications, aerospace, and computing that are a direct result of government investment.

I would submit today that our nation's classrooms operate in the technological equivalent of the 1950's and this will not change until the US government makes a commitment to invest in the technology of learning. Some in industry, like GTE, will experiment with technological applications in schools, but the industrial and technological power of the US will not focus on this vital area until the Federal Government establishes the priority of technology in the classroom.

Simply put, the power of the US technological industry often follows government R&D investment. Isn't it time for an education version of Star Wars? Or a classroom based version of the Manhattan Project? I believe that for far less money just as much can be achieved.

I firmly encourage you to support the bill before you today. It will establish education research and development as a priority and it will provide the funds that will ensure industrial participation. As a technological nation we have shown the world that no one can compete with our smart bomb, stealth aircraft, and lightening fast command and control systems. Let us now show the world that no one can compete with our interactive, multi-media, high technology classrooms.

Thank you.

Senator BINGAMAN. Thank you very much.

This has been a very impressive demonstration; all of them were very impressive.

Let me just say a couple things to conclude our hearing because we do have another hearing starting up right away in this room. But I want to thank all the witnesses and those who put on these demonstrations. I think it has been very useful testimony and will be very helpful in persuading other members of the committee and other Members of Congress in going forward with this legislation. We have, I think, a real opportunity to use technology to achieve our national education goals, to help States and local school districts achieve those national education goals, and I think we have seen some concrete examples here today of how that can be done.

So I am very excited about the possibility of moving ahead with this legislation, the possibility of getting the Federal Government in much more of a proactive role in helping to see this occur.

So again I thank you all.

Let me particularly thank some of the staff who have worked so hard on this legislation and preparing the hearing. Gerry Anderson has been very helpful throughout the process of preparing the legislation. Ellen Giney is on Senator Kennedy's staff, who have been essential and crucial to our ability to get this legislation where it is. Doris Dixon on Senator Cochran's staff; Ray Ramirez, who was on my staff and was key in getting this legislation prepared; and Beth Beck, who has been the person who really did yeoman's work in getting this hearing together today.

Let me stop there and thank you all again for being here. I think it has been a very useful hearing.

[Additional material submitted for the record follows:]

ADDITIONAL MATERIAL

ANSWERS TO QUESTIONS OF SENATOR SIMON FROM VALERIE WILFORD

Question 1. At the hearing, your panel was asked that given the tight fiscal times, if we could fund only one thing under this act, what should that be?

Answer 1. I believe that the training of teachers and school library media specialists in the effective use of technology is crucial. Mastering the use of new technologies and the strategies for their integration into the instructional program can empower teachers, students and entire schools. School library media specialists and teachers need on-going training to enable the curriculum to evolve and to enable students to experience the creative techniques of information-seeking with technology.

Question 2. School libraries and media centers seem like a natural for new educational technologies. Do you agree with this view and why?

Answer 2. School library medial apecialists must play a key role in the evaluation, selection, and integration of the new technologies into the instructional program. They are educated to evaluate, select and manage the new technologies that will make ideas and information accessible. However, the ability of school library medial specialists to perform that role is seriously impacted by the lack of current instructional resources in a variety of formats. Once a year, Marilyn L. Hiller and Marilyn Shontz, library educators at the University of North Carolina at Greensboro, prepare a survey summarizing developments in public and private school library medial programs. This year's survey, to be printed in the October 1993, issue of School Library Journal states, "Regardless of how the data is presented the picture of Library Media Center book collections in the United States is indeed a devastating one. Library Media Center book collections are stagnant. Only in the very smallest of schools with under 250 students enrolled is one book per child being added to the collection."

Question 3. In your testimony, you spoke about the dire situation many school libraries face. What steps at the federal level should be taken to address school libraries' needs?

Answer 3. I would hope that the legislature, specifically the Senate Committee on Labor and Human Resources, will recognize the critical need to make current information in a variety of formats 9books, periodicals, CD ROM products, laser discs, etc.) accessible to our nation's students through a federal program of sustained support. I would recommend that Senate Bill 266, which you introduced earlier this year, be incorporated into the upcoming reauthorization of the Elementary and Secondary Education Act. Such a federal initiative would represent a significant commitment to the enhancement of educational programs throughout the country. An alternative suggestion would be to earmark a percentage of Chapter 2 funds specifically for school library media resources.

PREPARED STATEMENT OF TOM TAUKE

Mr. Chairman and members of the Committee: Thank you for the opportunity to submit comments for the record on S. 1040, the "Technology for Education Act of 1993." My name is Tom Tauke and I am Vice President, Government Affairs for NYNEX Corporation. NYNEX is a leader in helping people communicate using information networks and services. The company's Telecommunications Group—which includes New England Telephone & Telegraph Company and New York Telephone Company—provides voice and data communications services in the northeastern United States. NYNEX Worldwide Services Group provides network and information systems in the United States and in seventy other countries, wireless communications services in the Northeast, and directory publishing worldwide. NYNEX also offers financial services. Today I am submitting this testimony on behalf of all seven Regional Bell Operating Companies (RBOCs): Ameritech, Bell Atlantic, BellSouth, NYNEX, Pacific Telesis, Southwestern Bell, and US West.

Over the past few months, I have had the opportunity to testify on two occasions about the future of the telecommunications infrastructure and, more broadly, address various aspects of what is coming to be known as our evolving National Information Infrastructure (NII). Legislation such as H.R. 1757, the "National Information Infrastructure Act of 1993," and its companion legislation, Title VI of S. 4, have promoted great interest throughout the telecommunications and information industries, as well as the education, health care, and various other user communities. The legislative process has served as a catalyst to bring these disparate groups together for constructive discussion of various important issues regarding the NII.

Mr. Chairman, I want to commend you for the Committee's attention to the needs of the education community. As set forth both in Section 2 (Findings) and Section 3 (Purpose), S. 1040 seeks to maximize the use of emerging technologies to provide exceptional new opportunities for students and educators alike to enhance the learning process. I am happy to report that utilizing telecommunications technology in educational applications is not a new concept for the seven RBOCs. Collectively, our companies are involved in dozens of programs throughout the United States, ranging from the Buddy System in Indiana, which the Committee featured during the July 21st hearing, to various distance learning programs in numerous states such as Minnesota, Colorado, Arizona, Idaho, and North Dakota.

For the Committee's consideration I have attached a sampling of the education projects and programs in which various RBOCs have participated.

Before reaching the specifics of S. 1040, I would like to take a few moments to discuss our view of what we believe is necessary to effectively develop the NII. S. 1040 undoubtedly fits into the NII landscape of the future, and thus we have analyzed the bill within this framework.

In its May, 1993 report entitled "Vision for a 21st Century Information Infrastructure," the Council on Competitiveness noted that the NII will "enable all Americans to access information and communicate with each other easily, reliably, securely and cost effectively in any medium—voice, data, image or video—anytime, anywhere. This capability will enhance the productivity of work and lead to dramatic improvements in social sciences, education, and entertainment." According to the Council, the essential components of the NII include: a set of widely accessible and interoperable communications networks; digital libraries, information databases and services; easy-to-use information appliances and computer systems; and trained people who can build, maintain, and operate these resources.

Numerous other groups, such as the Computer Systems Policy Project, have espoused similar principles, with which we are in full accord. Indeed, the seven RBOCs joined with six other communications companies and signed a statement of principles outlining the companies' view of the proper policy position for the development of the NII. That statement is also attached. As it continues to evolve, the NII will be driven by the desire to meet urgent societal needs, and be shaped by the markets it will both create and serve. Along the way, as we all strive for universal access and global interconnectivity, the NII will undoubtedly become more and more user friendly.

Making the NII broadly available to schools, residences, and a variety of other users will obviously require an extremely large investment, and the participation of numerous organizations with various skills. To achieve this goal, a policy framework which appropriately balances the roles of government and the private sector is critical. Accordingly, we believe that the prime role of the government should be that of a catalyst for development of the NII, providing needed support for: users; leading-edge technology development and testbed networks; research in user-friendly access and use of networks; training; and research into applications and services.

In return, the private sector will develop products and services driven predominantly by market demand. The full benefit of this market demand can only be realized if there are substantial changes in public policy as regards the pricing of communications services, and if all potential service providers are permitted to compete. Even with these changes, we recognize that market demand may have to be supplemented with public policy actions that will guarantee ubiquitous deployment of the NII. Overall, however, there must be adequate incentive for the private sector to invest in the NII if it is to become economically sustainable. In the end, competition can flourish if the government makes the right public policy choices.

Specifically with respect to the NII and education, it is clear that commercial service providers—such as the RBOCs and a wide variety of others—have developed and are continuing to develop and offer services that will meet various needs of the K-12 education community. Obviously, these investments are undertaken in the hope and expectation that the K-12 community will view them as the best value for their limited resources. Only where these investments do not result in the appropriate services being offered should the K-12 community resort to creating or purchasing the services from networks that receive federal funds. Moreover, if a private network is chosen—and that network receives government support—we feel strongly that such private network should not be allowed to resell services to others and that access should be limited to the government mission for which the funding originally was granted.

In the absence of such restrictions, a large disincentive for private sector investment in networking infrastructure would be created and, of course, the fixed cost of current commercial networks would have to be recovered from a smaller base of users, thus raising their prices. The fact that subsidized providers of services in

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competition with unsubsidized, commercial providers can produce such undesirable effects should not be surprising to anyone.

With that backdrop, Mr. Chairman, I want to commend you for the Subcommittee's hearing on July 21st, which served as a showcase for the difference technology can make in the learning environment. I was delighted to see the video regarding Indiana's Buddy System Project in which Ameritech plays an important role, and I was very impressed with the enthusiasm of the various students who were present and participated in the demonstrations. I share with you your desire to find creative ways to extend these types of programs to every child in America and can assure you that the RBOCs want to continue to be part of this essential endeavor.

While we applaud the general purpose and focus of S. 1040, it is important to share with you our concern with certain aspects of the legislation as it is currently drafted. As a general matter, we have concerns with various provisions of S. 1040 which would appear to encourage the development or continuation of private telecommunications networks for educational purposes regardless of the availability and appropriateness of the use of existing and future commercial networks.

After discussion with your staff, however, we understand that S. 1040 is not intended to achieve that result. More specifically, we understand that S. 1040 has not been crafted purposely to exclude the participation of commercial network service providers, limit the choice of technology to be used by awardees of funds authorized by this bill, or, perhaps most importantly, encourage the construction of parallel networks that duplicate existing facilities or services.

Accordingly, we are confident that S. 1040 can be amended to address these concerns so that the entire telecommunications community will remain able to fully participate in new and exciting education concepts. Please allow me briefly to address a few of our specific concerns.

Appropriately Target Subsidies, and Treat All Alike. S. 1040 makes extensive reference to "noncommercial telecommunications entities" as defined in the Communications Act of 1934, Section 397(7). These include any network that is owned and operated by a State or its subdivisions or departments, or any network organized primarily for the dissemination of cultural and educational programming. Commercial network providers including telephone companies, value added networks, and many Internet service providers are not noncommercial telecommunications entities, and would not be able to participate in those activities reserved for noncommercial telecommunications entities. Commercial providers are beginning to introduce new services that can benefit the educational community, and provisions of this legislation that limit participation in some activities to noncommercial telecommunications entities may delay the deployment of these services. A more productive approach would treat all telecommunications entities alike. Neither commercial nor noncommercial networks should receive direct federal subsidies to provide commercially available services. Rather, in that case, subsidies should be provided to customers or their consortia. Providers of networks—whether commercial or noncommercial—appropriately should receive subsidies to stimulate research in networking technologies and applications and in certain other circumstances.

Specific Technologies and Construction of Duplicate Networks. A substantial portion of S. 1040 addresses the Star Schools program, created by Congress in 1988. Section 902(d)(A) on page 73 of S. 1040 requires that "not less than 25% of the funds available 9 to the Assistant Secretary in any fiscal year under this title shall be used for telecommunications facilities and equipment." Section 904(b) specifies, in some detail, the characteristics of the network to be constructed with the funds authorized by this bill. The net effect of these provisions is to encourage proposals for expensive solutions based on purchasing facilities and equipment, rather than more cost-effective solutions based on purchasing services from network service providers. We are concerned with the preference in the legislation for the construction of private networks based on newly installed telecommunications facilities over the purchase of network services derived from the capacity of existing network service providers.

In general, we believe that the public will be better served by allowing all interested parties to compete on an equitable basis in the growing market for network services. Government, in its role as leader, should seek to allow cost-effective partnerships to flourish, and the exclusion of commercial service providers from various portions of the bill is not consistent with this role.

The effects of the bill (as currently drafted) on the development of the communications infrastructure are worrisome. Current investments by commercial network providers in network services that can benefit K-12 education (such as ISDN and Frame Relay) are based on the expectation that costs can be recovered from a large customer base. If segments of the market are encouraged by government subsidies

to 10 seek private network solutions, the incentives for the commercial providers to invest in the infrastructure will be reduced.

For this reason, we favor a policy that encourages consumers to use commercial network services whenever they are available. The construction of private networks should be considered only if commercial services are not available, or if some extraordinary need (such as national security) dictates the use of separate facilities. When private networks are created with government grants, we believe that access to these networks be limited to those who are part of a specific government mission, and that these networks be prohibited from reselling excess capacity to other users. This prohibition will ensure that commercial providers will not have to compete unfairly with subsidized or free networks, and will preserve the incentive for private investment in the infrastructure and the ability to share infrastructure costs across a large customer base.

Mr. Chairman, we believe that all these specific concerns we have identified in S. 1040 come down to a basic question of the best and most appropriate use of scarce federal resources. Unnecessary duplication of network resources is simply not a good idea; providing the private sector with sufficient incentive to continue building the NII is a good idea. While both K-12 and other NII users should be encouraged to fill unmet needs any way they can, competition between subsidized networks and commercial ones will not lead to long-term economic sustainability of the system. Mr. Chairman, I thank you again for allowing NYNEX, on behalf of all seven ROBCs, to submit these comments. We look forward to working with you and your staff on this important legislation.

PREPARED STATEMENT OF STANLEY D. ZENOR

Mr. Chairman and members of the Committee: Thank you for the opportunity to provide comment on S. 1040.

The Association for Educational Communications and Technology (AECT) is the oldest, and one of the largest, associations for educators involved in the application of technology to improve learning and instruction. The more than 25,000 educational media and instructional technology professionals represented by AECT are pleased that this legislation recognizes the vital role that technology, in all of its forms, will play in the improvement of our nation's schools as we implement strategies to reach the National Education Goals by the year 2000.

The strength of S. 1040 is the comprehensive and systemic nature of the legislation. This Bill sets forth a vision on the use of technology to improve education and establishes an Office of Technology within the Department of Education to carry out this vision. Through the provisions of the Bill, mechanisms are established for: information dissemination; technology training; the development, production and distribution of curriculum-based instructional materials; and for research on and the assessment of technology in education. Every section of this Bill is interrelated.

Establishing an Office of Educational Technology within the Department of Education, under the leadership of an Assistant Secretary, is a critical first step in bringing our schools into the technology age. The current structure of the Office of Educational Research and Improvement (OERI) within the Department of Education does not provide a focal point for technology leadership. In recent years, with the exception of the Star Schools legislation, OERI has shown little, if any, interest in the role of technology as a tool to improve our nation's schools. The currently funded programs with technology emphasis or components are spread throughout OERI. There is no apparent centralized leadership or coordination of programs.

The Office of Educational Technology will provide for the coordination of technology-related programs and activities within the Department of Education. Without this leadership, funding programs involving technology will continue to be disjointed rather than comprehensive and complimentary. Without this leadership, it is unlikely that the role of educational technology in our nation's schools will ever become a priority within the Department of Education. It is essential that we have the leadership of the Office of Educational Technology if our schools are to realize the power of educational technology to improve the education of our nation's students today and in the future.

Title II of the Bill, School Technology Support, ties leadership at the federal level to leadership at the state level. Through the State Technology Planning Grants, states will have funding available for comprehensive educational technology planning. Through the coordination of these grants, the duplication of planning efforts between states can be reduced, the sharing of resources enhanced, and strategies developed that will enhance the development of comprehensive state, district and building level technology plans.

The funding in Title II, Section 203, will begin rebuilding the infrastructure of technology-based curriculum materials available in our school library media centers. The quality of learning resources materials available in our schools has diminished in recent years through the lack of federal funding support. The majority of school budgets cannot keep pace with the demand to replace such traditional print material as an atlas that becomes dated and of limited use almost overnight due to global upheavals like the recent breakup of the Soviet Union or the unrest in Yugoslavia. Securing funds to acquire technology-based curriculum materials is even more difficult. To truly rebuild this infrastructure, funding approaching the level contained in S. 266 is needed. Additionally, this funding needs to be categorical in nature. Experience with block grant funding programs has shown that funds have often been diverted to activities or functions for which they were never intended. Only by reinstituting categorical funding can we be certain that authorized federal funds will be spent in the manner intended by the legislation.

Funding under Title II, Section 204, School Technology Resource Grants and Loans, also needs to be categorical in nature. By developing categorical funding under this title of the Bill, you will be certain that federal funds are spent on the appropriate technology resources for our nation's classrooms. Without categorical funding, it is possible that these funds could be diverted for other "technology" uses within the schools, such as administrative computer systems, limited use telephone systems, and other non-curriculum based uses.

Title III of the Bill will create, for the first time since the NDEA legislation, the appropriate mechanisms for the dissemination of information on the effective uses of technology to improve student learning, and pre-service and inservice teacher training on the applications and integration of technology into the classroom curriculum. Ongoing training will enable teachers to effectively utilize available and emerging technologies in their classrooms. Technology alone cannot change what goes on in the classroom. Simply placing equipment in our schools will not make the difference. The difference will be achieved when teachers have the ability to integrate the technology into the teaching of Mathematics, Science, Language Arts, and so on across the curriculum. The various sections of Title III make it possible to provide the training resources and opportunities necessary to prepare our teachers to effectively use these tools for teaching and learning.

Title IV of the Bill is of significant importance in that it supports the development, production, and distribution of technology-enhanced curriculum materials through a variety of programs. In addition to reauthorizing the Star Schools Program, the Bill provides funding for the development of curriculum materials by consortia of private industry and businesses in partnership with educational institutions. This provision will insure that quality a curriculum materials developed with federal assistance will be made available to the larger educational community through the private sector.

Title V of the Bill establishes funding to support research on the effectiveness of technology in education and on advanced uses of technology within education. This research will help to transfer the advanced technologies being utilized in the private sector into our classrooms. The research will also point the way toward the most efficient and effective uses of these technologies to improve our schools. Additionally, the annual assessment of the state-of-the-art uses of technology in our schools will help guide future federal, state, and local efforts to infuse technology into every part of the school curriculum.

This legislation represents an opportunity for our schools to begin moving into the technology age. Through this Bill, the Department of Educational Technology within the Department of Education will provide leadership in guiding our schools forward as they deal with implementing and integrating technology into the classroom curriculum. The systemic provisions of S. 1040 offer a comprehensive approach to resolving the problems facing schools today. S. 1040 will have a positive impact upon our schools and upon the students they serve.

STATEMENT OF THE AMERICAN PSYCHOLOGICAL ASSOCIATION

THE TECHNOLOGY FOR EDUCATION ACT OF 1993

Chairman and members of the Committee, we are pleased to have the opportunity to provide testimony on behalf of the American Psychological Association with regard to the RTechnology for Education Act of 1993, introduced by Senator Bingaman and sponsored also by Senators Kennedy and Cochran.

Our names are Susan R. Goldman and James W. Pellegrino and we are Professors of Cognitive Science. We are writing as Co-Directors of the Learning Technology Center, located in Peabody College at Vanderbilt University. We have been conduct-

ing research and development activities for the past decade in an effort to understand how technologies can be used to create environments that enhance student-teacher interactions around learning goals thereby improving student learning and teacher effectiveness. At the Center, our development activities are always grounded in empirical research into basic processes of learning and cognitive development, especially in the content areas such as mathematics, science, language and language arts. Along with our Center colleagues we have published numerous articles on the role(s) technologies can play in reshaping classroom instructional environments.

In our testimony we will describe (1) the strengths of the Technology in Education Act; (2) areas of concern; and (3) issues regarding the implementation of the mandates outlined in the Bill. In so doing, we will also offer suggestions that deal with the needs and concerns that we see. On the whole, we support enactment of such legislation and we are impressed with the care and attention given to the issues related to educational technology and its potential impact on schools, teachers and students.

Strengths of the Bill

The initial findings section is an excellent statement of the issues regarding the role of technologies in improving American education and achieving the National Education Goals. Equally significant are the purposes of this act and the high level objectives contained therein. Educational technology is a significant component in America's educational planning and future. To date, this field has been fractionated, with a lack of coordinated activity within states and at the federal level. Creation of an Office of Educational Technology is a major step in the direction of rectifying this problem. Placing a unit like this in the Department of Education under the direction of an Assistant Secretary is extremely appropriate.

A major strength of the bill is the recognition that major teacher training activities—both preservice and inservice—and ongoing professional development activities are critical to creating a climate where the potential of technologies can be realized and sustained. Funding to support both the acquisition of technology and the training and support services on an ongoing basis are absolutely critical. Our own experience in classrooms in multiple states continually shows teacher training and ongoing teacher support as major stumbling blocks in the adaptation of technological innovations to local situations. The current bill contains a number of provisions and funding mechanisms in support of this set of activities. Equally critical are the provisions to ensure linkages of teachers, students and schools to electronic networks such as INTERNET and the developments related to NREN. K-12 education must be a major part of an electronic superhighway and mechanisms to insure adequate analysis of how this can be achieved are an important component of the present bill.

Technological innovation is a slow process since it requires changing the climate of the schools at multiple levels and the opportunity to work with technology within learning environments that are "organic." A strength of the current Bill is that the initial funding commitment of 5 years is the minimal amount of time needed to insure adequate progress toward achieving the many purposes of this legislation with the hope of reasonable return on the investment of funds through sufficient time for evaluation of initial efforts.

The current bill contains a research component in Title V which is critical to the success of this endeavor in the short and long term. However, the research funding and agenda is not nearly large enough relative to the broader goals and activities to be supported by the current bill provisions in Titles I-IV.

The bill has a number or provisions representing an effort to identify and encourage standards for hardware, software and communications protocols. These are important to insure that states, systems and schools who participate early on in the process of technology adaptation are not penalized by the many rapid changes in the technologies of interest. It is certainly not clear when, or if, stabilization will occur. Thus, plans proposed one year may be outdated 6 months later unless they are specified in terms of the pedagogical goals of the learning environments and the ways in which technologies are to be used to enable them.

Areas of Concern

Too much emphasis appears to be placed on technology qua technology as a solution in and of itself and not enough on the learning goals and outcomes desired. Technology is not a universal panacea. Too often in the past technology has been "put" into schools with the expectation that education would change because of the presence of technology, e.g., the influx of closed-circuit television in the late 1950's, early 1960's. This is exactly the wrong way to think about technology and educational impact. Technology needs to be thought about from the perspective of what the educational objectives are and how specific kinds of technology and technological

resources can support achievement of those cognitive objectives. This is the major weakness in the current presentation of this educational technology initiative. This is especially apparent in section 403.b where reference is made to increased achievement levels. An implementation of this Bill needs to carefully define what kinds of achievement are sought. Especially important is the fact that technology opens up several opportunities for enriching the kinds of skills that students master in schools and thus attention must be paid to clarifying what those skills are or might be, how they are framed and assessed, and whether there is appropriate technology support in the classroom for their attainment. Related to this concern is the fact that the Commission composition lacks representation from members whose specialty is in the area of learning and development. It is critical that the agenda and analysis of issues achieve greater balance between a research perspective and the technology development and service delivery perspectives.

The bill provides for a number of dimensions related to teacher training and professional development but does not appear to give adequate attention to administrators as well as teachers. For teachers to succeed there must be knowledge, training and support across vertical levels within any system. In addition, the emphasis in implementing support should be continuing and ongoing support needs and on the development of programs for the latter rather than just initial training and startup activities and programs.

In the area of research, the agenda appears limited. Materials development and evaluation research, of the types proposed in the current Bill (Title V), are only some of the many types of research that should be supported and pursued. Prospective research studies need to be done on learning goals and activities so as to avoid the concretization of a prototype that is not producing the desired outcomes. The research agenda needs to remain flexible and broad, including basic research studies of learning processes. The latter are critical to insure that knowledge will be available to support any modifications that can and should be made in the development of specifications for technology designs. The dollars provided for research should be expanded, especially given the scope of the research agenda, and adequate provision must be made to insure that field initiated proposal competitions are a major vehicle for research support.

Concerns regarding implementation

Our concerns regarding the mandates and implementation of the Bill are of two general types. The first is that the mandates and activities in Title 1 specified for both the Office of Educational Technology and the Commission are so enormous in scope that they may be unattainable within the given time period, especially considering the limited funds provided for each entity. Some of the mandates might be better accomplished by the Office of Technology Assessment in a 2-3 year in-depth study or by making use of the excellent reports on technology that they have been producing over the past several years. If the OTA is involved they should work with the Commission, rather than in parallel.

A second and related concern is that the Bill emphasizes many aspects of interagency coordination. For an educational technology agenda to succeed such coordination is important across the various agencies of the federal government. Specifying that such coordination is necessary is not the same as providing an explication of the mechanisms and authority by which this is to be achieved. The current Bill does not make clear the authority vested in the Office, the Assistant Secretary, the Commission or the Department of Education to insure cooperation from other federal agencies.

Statement of the Business Software Alliance

This statement is submitted on behalf of the Business Software Alliance (BSA). BSA exists to promote the continued growth of the software industry through programs to eradicate software piracy. The focus of these programs is understanding and compliance with software copyright laws in the United States and around the world.

Member companies of BSA include: Aldus Corp., Apple Computer, Autodesk, Borland International, Computer Associates, GO Corp., Lotus Development, Microsoft, Novell, and Wordperfect. These companies account for 71 percent of the prepackaged PC software published by all U.S. companies.

BSA applauds Senator Bingaman and the original cosponsors of the "Technology for Education Act of 1993" (S. 1040), Chairman Edward Kennedy and Senators Tom Harkin and Thad Cochran, for recognizing that the utilization of technology in our nation's educational system is an essential element to the successful development and maintenance of a technologically literate citizenry and internationally competi-

tive work force. While supporting the goals of the legislation, BSA is opposed to provisions contained in S. 1040 which contemplate the establishment of national "standards" for educational software. BSA is strongly opposed to the establishment of national standards for educational software for the following reasons:

National Standards Are Unlikely to Keep Pace with Rapidly Developing Technology

The technology in the software industry changes at a rate virtually unknown in any other industry or segment of the U.S. economy. The feasibility of altering established national "standards" quickly enough to reflect rapidly developing industry practices and advances is doubtful. Indeed, the market has already demonstrated that it is able to respond quickly to interoperability and user interface concerns. No software manufacturer today can survive by manufacturing products that work only within their own product lines. BSA does not believe that the establishment of national standards would aid this process, but rather could actually impede it.

National Standards Would Bestow Market Advantage to Particular Companies, Have Detrimental Impact on Industry and Drive Up Costs of Technology Products for Schools

The establishment of national standards raises the problem that the particular software company or companies whose product or products are chosen as "the national standard" would be given a definitive market advantage over other companies which would have a crippling effect on the companies whose products are not chosen as well as a negative impact on the software industry as a whole. Indeed, to the extent national standards reduce competition, the prices of education technology products will increase thereby further depleting the limited resources of schools.

National Standards May Actually Inhibit the Education of Children in the Area of Technology

The establishment of national standards may actually inhibit the education of children in the area of technology: children educated under a system that provides only a singular glimpse into an extraordinarily wide-ranging industry may find themselves confused and disadvantaged when they go into the "real world" and face the array of software technology available and in use. It would be particularly unfortunate if the actions taken to improve our nation's educational technology were unduly narrow and thus limited a student's opportunity to learn.

BSA believes that a better alternative to the establishment of national standards for education hardware and software would be to establish objectives to ensure that educational technology products for use in schools use industry-developed standards for hardware, software, multimedia technologies, and communications technologies that (1) support maximum interoperability nationwide; and (2) are accessible and usable by all persons.

BSA appreciates having this opportunity to express its views on S. 1040 and looks forward to working with Senator Bingaman, Chairman Kennedy and the other members of the Senate Labor and Human Resources Committee as this legislation moves through the legislative process.

STATEMENT OF JEANNE HAYES

Mr. Chairman and members of the Committee on Labor and Human Resources: Thank you for this opportunity to present information on behalf of Quality Education Data, Inc. (QED) relating to S. 1040, the Technology for Education Act of 1993. Since 1981, QED has gathered and published data on the installed base growth of instructional technology in the nation's schools. Beginning with the computer and growing to include the latest multimedia, telecommunications and distance learning technologies, QED has seen the use of instructional technology virtually explode. Our reports on the usage and purchase plans of educational technologies in schools have been cited in many periodicals, including the New York Times, Wall Street Journal, U.S. News and World Report, USA Today, Educational IRM Quarterly, Washington Post, and congressionally commissioned studies on schools, such as Power On and Linking for Learning. QED has also been called upon to assist state education agencies, such as the Texas Education Agency, in equity of education issues. Mr. Chairman, I have included copies of two of our reports for you and the other members of this Committee.

I would like to applaud you and the other members of the Labor and Human Resources Committee for the leadership you have shown in preparing this bill and your recognition of the value of technology in teaching students in the 1990's and beyond. This bill provides a comprehensive strategy and infrastructure to prepare the nation's elementary and secondary students for the competitive work force they will one day face.

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As a former educator I am very much aware of the value of technology in education—the motivation it provides for students to seek out new information and generate new ideas. I am also aware of how frustrating it can be for many educators to afford, implement and manage technology-based curricula. Clearly, a Bill such as this can only benefit both the students who will learn from technology-based instructional programs and the teachers and administrators responsible for using the technology to its greatest instructional capacity.

The purpose of this testimony is to help shed some light on the issue of equity and how this Bill could resolve equity discrepancies. From our compiled database of all U.S. public schools, I have prepared some figures regarding access of students to instructional computers and how this access differs among schools of varying demographic characteristics. This access can be described by a term we call Microdensity, or the ratio of total student enrollment in a school divided by the total number of instructional computers in that school. While we collect data on the usage of other instructional technologies, including CD-ROM, Interactive Videodisc, Integrated Learning Systems, Networks, Modems, Cable and Satellite Dish, the access to personal computers—the "core" instructional technology, provides the best barometer to gauge equity issues in educational technology.

The national average Microdensity for the 1992-93 school year was 16 students per computer. While this ratio has gradually improved over the years (down from 125 students per computer 10 years ago), impoverished schools and schools with high non- white enrollments maintain student/computer ratios similar to the national average 4 years ago. In contrast, wealthy schools and schools with high white enrollments exceed the national average of students per computer. The following tables illustrate my points.

Microdensity (students/computer) by Ethnic Enrollment

Public Schools—1992–93

Non-white (percent)	Total	School Enrollment	
		300+	500+
0–24	15.1[1]	15.7	15.8
25–49	15.3	15.8	15.9
50–74	16.2	16.8	17.4
75–89	17.2	17.9	18.9
90–100	21.1	21.2	22.0

[1] Read as: 15.1 students per computer in schools with 0–24% non-white enrollment.

Microdensity by Chapter I Student Percentages

Public Schools—1992–93 School Year

Poverty (percent)	Total	School Enrollment	
		300+	500+
1–10	15.7[1]	16.2	16.3
11–25	15.9	16.7	17.2
26–50	16.4	17.3	17.8
51–100	20.4	21.2	22.5

[1] Read as: 15.7 students per computer in schools with 1–10% of students qualifying for Chapter I funds.

Microdensity by Neighborhood Lifestyle

Public Schools—1992–93 School Year

Neighborhood Lifestyle	Microdensity
Upscale	14.2[1]
Midscale	15.3
Downscale	16.5

[1] Read as: 14.2 students per computer in schools within upscale neighborhoods.

As you can see, public schools with higher percentages of non-white students have much poorer student/computer averages, as do schools with higher percentages of

students qualifying for Chapter I funds and schools located in "downscale" neighborhoods. The ratios become even worse as the school enrollment grows.

Clearly, the measures provided by S. 1040 are essential to balance the access of students to instructional technology regardless of the school's ethnic and neighborhood makeup. The bill also makes it possible for schools to upgrade their existing base of computer hardware, which is essential in order to take advantage of the newer multimedia instructional software programs that require more advanced hardware systems.

For years, schools have kept inventories of 8-bit computers, the type first introduced in schools in the early 1980's. These computers are nearly obsolete as far as new instructional software packages are concerned, but, due to budget constraints, schools and school districts continue to use these machines. To truly realize the power of technology in education, many schools will need to upgrade their current installed base of computers. The following table illustrates the current installed base of computers by brand in the nation's public schools.

Microcomputer Market Share in U.S. Public Schools

1992–93 School Year

Brand	Total Units
Apple Computer:	
Apple II	1,633,056
Apple IIGS	190,806
Macintosh	702,480
Total	2,178,919
IBM	467,769
IBM PS/2	261,448
Tandy Co.:	
Radio Shack	66,175
MS–DOS Tandy	106,782
Total Tandy	150,795
Commodore (incl. Amiga)	54,056
MS–DOS Other	478,749
Atari	12,035
Franklin	5,492
TI	4,732
Other	105,603
Total	3,719,598

The total number of computer units per brand is calculated using an equation that imputes a total for the school year based on QED's January, 1993 report, Technology in Public Schools, 1992-93. The total for the entire school year, through June 1993, is calculated using installed base growth rates from the 1991-92 to the 1992-93 school year and a projected growth rate for the 1992-93 school year. Missing data are also accounted for in calculating 1992-93 installed base figures.

Mr. Chairman, to position America as a competitive force in tomorrow's workplace, we must focus our efforts on improving the education of today's elementary and secondary school students—both the advantaged and the disadvantaged. Through a well-designed and well-implemented S. 1040, we will certainly create an effective environment to accomplish this. Thank you.

STATEMENT OF DENNIS L. BYBEE

Mr. Chairman and members of the United States Senate Committee on Labor and Human Resources:

Thank you for this opportunity to comment on S. 1040.

As the largest society of professional educators working with technology in American education, we are pleased to see the Congress consider this "historic legislation" which will support the development, acquisition, and use of technology in schools across America.

The Sponsors of S. 1040 are to be commended for their leadership and foresight in recognizing the potential uses of technology as a tool in the learning process to improve all aspects of education while creating a technologically literate citizenry and internationally competitive work force.

Supports systemic reform of education in America

This Bill provides much needed essential support for systemic reform in American education by establishing a critical focal point for Federal leadership on technology for education issues in the United States Department of Education and by creating a comprehensive national educational technology infrastructure which will: encourage State educational technology planning; address equity in student access to modern learning technologies; provide information on effective educational uses of technologies; support local technical assistance and teacher training; promote education technology product development; stimulate research on the application of advanced technologies to meet educational needs; help develop educational access to high performance computing and telecommunications networks; create assessments on the effectiveness of technology in education; and provide decision support reports on the state-of-the-art with respect to school uses of technology.

Implements the administration's commitment to the establishment of high performance computing and telecommunications networks [1]

As a companion to Senate Bill 4 and House Resolution 1757, this Bill will ensure that the Administration's expenditures on high performance computing and telecommunications networks as our "highways of the future" will be of maximum benefit to all Americans. Since this Bill supports the identification of educational requirements for high performance computing and telecommunications networks and stimulates parallel development of local school technology utilization resources, regional technical assistance and teacher training consortia, and commercial development of needed technology products and services for use in the educational enterprise, its passage as a companion measure is absolutely essential.

Implements the education Secretary's commitment to elevating the Department of Education's leadership role on technology issues by creating an assistant secretary for technology

This Bill implements Secretary Riley's expressed belief ". . . that technology can play a vital role in helping our nation's schools implement systemic education reform, and . . ." [his] . . ."commitment to elevating the Department of Education's leadership role on technology issues." [2] by establishing an Assistant Secretary for Technology to manage an Office of Educational Technology within the Department of Education.

The United States Department of Education must have an Assistant Secretary for Technology as a focal point for this leadership, to manage the Department's technology infrastructure support programs, and to advise and coordinate Federal programs and uses of technology in education—both within the Department and among the various Federal Agencies.

This organizational structure is consistent with the way that such leadership and managerial functions are performed by technology support components in State and local education agencies and is the way that they should be performed at the Department to provide an articulation of support functions between local, State and Federal education agencies. Without which, the coordination of technology programs throughout the nation will not occur and educators who are in various stages of implementing new learning technologies will not benefit from the experience, success, and mistakes of others.

Provides school technology support

Equity is the "heart" of this Bill and resources are its "life blood."

More than any other learning resource known to educators, technology has the greatest potential for helping all learners achieve the highest levels of excellence demanded by our survival as a society in the Global World Economy. Unfortunately, technology also has the greatest potential for creating inequality of opportunity among learners because of their socio-economic status or the wealth of the community in which they reside.

Whereas differences have always existed in the kinds of learning opportunities made available to students throughout America, the result of differences resulting from the amount of financial resources available for education in different communities have been insignificant when compared to the differences in learning opportunities which are now possible as a result of expenditures on modern learning technologies.

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[1] "Technology for America's Economic Growth: A New Direction to Build Economic Strength", President William J. Clinton and Vice President Albert Gore, Jr., February 22, 1993.

[2] Secretary Richard W. Riley, May 28, 1993, in a letter to the Associate Executive Officer of the International Society for Technology in Education.

When one student has a 2-year old textbook, another has a 5-year old textbook, and yet another has no textbook at all but does have access to an effective teacher, no significant differences in achievement are expected. But, when one student has a learning tool as powerful as a personal computer connected to the world of information available over modern communications networks, and another has none, simple logic suggests that the anticipated differences in learning opportunities are intolerable in a democratic society committed to "equality of opportunity for all its people."

"In America, all students must be guaranteed access to learning technologies in their educational program whenever it is needed without regard to gender, race, ethnicity, socio-economic status, mental or physical limitations, geographic location, or the wealth of the community in which they reside."[3]

Equity begins with planning. The Federal government must encourage technology for education planning by State and local education agencies to ensure that their limited resources are used effectively and for the benefit of all students. Therefore, the Bill's provisions and funding for State technology planning are extremely important. Certainly, the planned level of Federal funding in the Bill will not support all the needed technology planning activities throughout the United States. But, the planned level of Federal funding in the Bill is sufficient to encourage such planning and concomitant expenditures by State and local education agencies should be expected as a result of the Bill's planning provisions.

Elementary/secondary school library/media center deficiencies must be corrected. According to the American Library Association, "our Nation's elementary and secondary school libraries are primarily dependent on a core of deteriorating and out-of-date library materials purchased with original funding from the Elementary and Secondary Education Act of 1965; school library media center expenditures, when adjusted for inflation, have declined 16 percent in public schools since 1979; and small and rural school libraries are further disadvantaged because of small budgets based on low student enrollments, and limited access to resources, services, and personnel."[4]

This Bill provides leadership for assessing and redressing these elementary and secondary school library/media center deficiencies by establishing a Division for Elementary and Secondary School Library/Media Center programs within the new Office of Educational Technology. As a fundamental infrastructure issue, this organizational component and the proposed "categorical" funding for this purpose will ensure that library/media center needs are addressed within the overall context of the Federal government's effort to improve access to modern learning technologies for all students.

School resource grants and loans. It has been estimated that about one-third of our nationals school districts cannot afford to resource minimal levels of technology to ensure group access to modern learning technologies and that still another one-third—that can provide group access—cannot afford to provide small group and individual student access to modern learning technologies.

For the "poorest" school districts, this Bill provides outright grants to help ensure that individual learners will be able to access modern learning technologies through their school's effective management of group learning resources.

For predominantly "middle class" school districts, this Bill ensures that long-term, low-interest loans are available (at no cost to the government) to support their immediate acquisition of modern technologies for individual and small group learning activities.

For "upper class" school districts, this Bill promotes development of more effective and affordable learning technologies through its several product development, production and distribution provisions; but, more importantly, it enables State and local education agencies to use currently available Federal resources to acquire needed technologies to accomplish objectives in all Federal education programs.

In these and other ways, this Bill removes barriers and creates equity in access to modern learning technologies for all students.

Creates a national educational information dissemination system and establishes regional technical assistance and teacher training consortia throughout the United States.

An information management crisis. In the modern information age, it is incredible—but true—that many educators do not utilize the most effective learning tech-

[3] VISION:TEST, International Society for Technology in Education, February 1991, page 4.
[4] American Library Association as cited in Senate Bill 3307 which was introduced by Senator Simon of Illinois in the 102nd Congress.

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nologies that are available. And, many educators do not utilize the learning technologies that they have available to them in the most effective ways.

In reflecting on this crisis, one must find that there is a wealth of information available (i.e., in research and in the expertise of practitioners) on what learning technologies are effective and there are many educators who know about them and can help others to learn about them and to use them more effectively.

So why is it not happening? Perhaps, there is too much information creation and not enough information dissemination! This Bill moves to resolve the crisis by creating a coordinated infrastructure to manage the information. It creates a much needed electronic dissemination network (using existing and anticipated public facilities) to make what is known about effective learning technologies available to anyone who needs to know it—from and at anywhere in America.

Moreover, this Bill creates an infrastructure of regional technical assistance and training consortia to ensure that human resources are available when needed to help schools plan, develop, implement, use, and manage education technologies everywhere in America. Technical assistance and training are essential components of this Bill—without which—its resourcing provisions would be ineffective and wasteful.

Stimulates technology product development, production, and distribution

Classrooms of the future. One of the most innovative provisions Of this Bill is the way in which it envisions development of materials for its "classrooms of the future".

For many years, the Federal government has literally WASTED its education dollars on so called "model programs". In what can only be justified as a "rationing" process, the Federal government has conducted a variety of competitive grant programs whose only impact on America education has been to improve the educational programs for students at the schools who won the grants. When projects were ineffective, the grants made "no significant" difference. When projects were effective, there was local improvement but no improvement in American education generally because dissemination of good ideas has never been effective. There is simply no incentive for a successful local or State education agency to disseminate information about their project outside the local district or State.

This Bill starts with development and dissemination of good ideas by design. By requiring product development consortia to consist of business and/or industry in partnership with educational group(s), development and dissemination of successful products is ensured from the start! The educational group has an incentive to develop successful products for its students; and the business and/or industry partner has a free enterprise interest in disseminating successful products.

The product development and dissemination provisions of this Bill should be considered for use in other competitive grant programs as an efficiency measure.

Instructional broadcasting and Star Schools. Certainly, there are no more well known success stories in the field of educational technology than the broadcast programs such as Sesame Street which began as Federally funded initiatives and the Star Schools telecommunications projects which have provided meaningful distance learning opportunities throughout America.

This Bill reauthorizes Star Schools programs and corrects legislative oversights which have inhibited their further development. What was learned in the Star Schools program is reflected in the Bill's instructional broadcasting provisions.

These two distance education initiatives are essential and their further authorization will ensure that there are educational resources available for use with the high performance computing and telecommunications highways which should be developed under provisions of S. 4 and H.R. 1757.

Funds research on advanced technologies for education; supports identification of high performance educational computing and telecommunications requirements; creates assessments on the effectiveness of technology in education; and provides decision support reports on school uses of technology

Research on advanced technologies. The research supported by this legislation is on those advanced technologies which have already been shown to be effective in business, industry, or government operations. This is very important since there are many examples of technologies being used effectively in business, industry or government operations and too little effort has been made to transfer these successful experiences to education. Focusing research on transference of successful technologies will ensure that education research dollars are leveraged by—and not wasted on—"basic research".

High performance computing (HPC) and telecommunications networks. The HPC provisions of this Bill will ensure that appropriate educational uses of HPC and tele-

communications networks are identified and communicated to HPC and telecommunications network developers. Without these provisions, it is possible that the education communities' requirements may not be adequately addressed by those who will ultimately develop them as our highways of the future.

Assessment. It is interesting to note that the assessment component of this Bill will not only provide traditional programmatic feedback (i.e., formative and summative measures of effectiveness) but that it will also create status reports and market surveys which the Congress and business interests can rely upon to manage public and private investments in educational technologies.

Funding authorizations reflect targeted allocation of federal resources

The strength of this Bill is that it is a systemic solution. While it may appear that substantial resources are allocated overall (i.e., about $340 million), funding for each of its several provisions are minimal and carefully targeted to maximize the impact of Federal support.

For example—

State Planning. Ten million dollars to encourage State technology planning (with no less than $100,000 per State) is not excessive and most States can be expected to match or exceed these funding allocations as they develop their State-wide technology plans. Support for planning is an effective expenditure of Federal dollars.

Regional Technical Assistance and Training Consortia. Fifty million-dollars to establish and implement ten regional technical assistance and training consortia is not excessive when one considers the number of schools, districts (over 15,000), and teachers (millions) who will be supported by these consortia. In fact, the Federal government must expect that schools, districts, and States will allocate funds from existing resources to obtain additional technical assistance and training services from consortia personnel. Here again, the use of Federal dollars to create a national infrastructure is an effective investment.

The bill is a systemic solution and its integral components must not be deleted or significantly altered

If any parts of the Bill are deleted, the resulting legislation will suffer the consequences of incomplete system design. All parts of the Bill are needed; because—as a whole—it presents a systemic solution to America's "Technology for Education" needs.

On the other hand, if only some parts of the Bill are retained while others are deleted, the resulting legislation may produce limited results even for the most needed component. Training is an example of an extremely important component which must not be deleted; yet, if training is provided to educators on technologies that they do not have available to them at the time of training, such training efforts can be wasted.

In considering this legislation, please be very careful not to delete or significantly alter any of its systemic provisions. To create an effective national technology for education infrastructure, the Federal government must—Establish the position of Assistant Secretary for Technology and assign that person responsibility for managing provisions of this Bill with an Office of Educational Technology; Provide resources for school technology support; Facilitate information dissemination; Create and maintain regional technical assistance and training consortia; Ensure availability of educational technology products and services; and Promote technology research, development, and assessment by passing and funding this "historic education legislation."

July 19, 1993

To the Honorable Members of the Committee:

I have had the distinguished privilege of serving as chairman of the Buddy System Project, a unique and innovative program which has been termed "the most exciting educational project in the nation, bar none." When we first entered classrooms and homes in five school districts in 1988, it was considered preposterous by many. Today, other states and even the country of Finland are planning to implement our concept. This fall, with the help of the Indiana General Assembly as well as continued private sector assistance, we will provide the Buddy opportunity to 50 schools and over 5000 Hoosier families.

Our vision is a computer in the home of every Indiana student in grades 4-12 used to extend learning beyond the classroom. The home computer ensures equal access for all children to the many resources and advantages afforded in the Information Age and allows each child, regardless of socio-economic background, the opportunity to reach his or her potential for a productive and fulfilling life. This vision also encompasses adults as well, seeing the potential to involve parents in the education of their children; to improve adult work force and technology skills; and to remediate and deal with the societal problem of illiteracy.

The home is not the only source of change evident with the Buddy System. Meeting the challenges and opportunities that technology affords our Buddy learners demands that significant change occurs in the classroom as well as in the teaching strategies employed by educators. The traditional lines between schoolwork and homework, between teacher and learner, as well as between work and fun, have blurred. In most Buddy classrooms, gone are the desks in neatly arranged rows -- grouped desks and work area tables are often the norm, including a mini-lab of computers which are in constant use throughout the day. Engaged learners no longer need to stop work at 3:00 PM when they go home. Teachers have become "learning guides" and are now active learners in their own right. Students are more confident and self-reliant, demonstrating responsibility in their work habits and respect for fellow classmates. The joy of discovery and learning exhibited by students and the delight of teachers in their own professional renewal is perhaps the most telling evidence of positive change.

Change has produced significant results with our students. Annual evaluations of project objectives have far exceeded our expectations. The evaluator points out that in terms of computer skills, Buddy students are in another league from comparison students. He continued that he would not be surprised to find many high school seniors who have less computer skills than the elementary grade Buddy students. Students spend 50-65 minutes per day at home on the computer and longer periods on weekends. After homework is completed, students double their time on the computer by working on activities above and beyond any assigned homework. Teachers indicate that Buddy students of all achievement levels do higher quality work, more complex work, and substantially more homework. Most importantly, educators and parents agree that students are more interested in school, have gained self-confidence, and are more highly motivated because of their Buddy experience. Parents have also greatly benefited from the project. Nearly half of parents report gaining valuable job-related skills. Anecdotes abound of parents who have become motivated to obtain a GED or who have obtained employment as a result of skills learned through Buddy.

As excited as I am by the Buddy System Project, those closest to the change express their feelings more personally. Attached is a letter we received last year from Superintendent R. Stephen Gookins of the Jac-Cen-Del Community School Corporation in Osgood, Indiana. His words convey the genuine excitement and sense of change that has enveloped this small rural community.

My task, and that of my colleagues, is to ensure that this opportunity is extended to every school child in our state. We know that these skills are needed in our work force today as well as tomorrow; we are confident of our results; and we know that such an effort can be completed for elementary grades for the price of little more than one day of school per year. I truly feel that we have developed the most outstanding educational technology venture in America today.

Respectfully,

Arthur G. Hansen

Arthur G. Hansen, Ph.D.
President Emeritus, Purdue University

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March 9, 1992

Mr. Marvin Bailey
President of the Buddy Project
One North Capitol, Suite 925
Indianapolis, IN 46204

Dear Mr. Bailey:

The Jac-Cen-Del Community School Corporation was honored to be selected as a presenter at the 1992 AASA convention in San Diego, California. We represented the Buddy Project for Jac-Cen-Del and the State of Indiana. Our presentation was well received. We did not realize how excited and enthused we had been about Buddy until after we had the opportunity to share our experiences with people from across the United States. As a reflection, I would like to briefly explain what Buddy has meant to our school corporation.

We are a small, rural school district with a low socioeconomic population. Employment with industry is limited in our immediate community; our patrons must travel 20 to 50 miles, one way, for employment. Many of our families have roots in farming. A certain segment of our population is transit. Because of this diverse population, the Buddy Project has not only been a rewarding opportunity, but also a challenge.

As a general statement, we have a 75 percent graduation rate. We have not had enough time to determine how Buddy will effect our graduation rate in the future but our first two years in the program have provided strong indicators that our graduation rate will improve. Our positive contact with parents of fourth and fifth grade students has increased by over 50 percent. Parents are now contacting the school to gain information about acquiring skills for themselves. The Buddy Project has provided opportunities for families in our school corporation that were only dreams two years ago. Now they are realities. We have students, teachers and parents communicating via telecommunications. The scope and base for learning has broadened and the learning process is no longer considered to be static; instead it is creative, exciting, and teachers realize there are no boundaries.

The project has not only provided opportunities for our students and parents, but it also has strengthened cooperative learning, peer tutoring, and brought the best out of our "Buddy" teachers. Two years ago, our fourth and fifth grade "Buddy" teachers were somewhat reluctant. Not only have they achieved at levels that they thought were impossible, but they have exceeded the corporation's expectations. The program has created a bond among faculty members who have worked to implement the program.

The Buddy Project made things possible for our school corporation that we only dreamed about. We watched wealthier school districts develop innovative programs, win grants, and build facilities that were only our "somedays." Now, we are part of the future. We have the technology, creative thinking, problem solving, and enthusiasm that is desperately needed in a public school environment.

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As a result of the success of the Buddy Project, we have been honored to have visits from state legislators, and a representative from Congressman Lee Hamilton's office. Further, we have been recognized nationally by the AASA and the NSBA.

The most significant element of the Buddy Project is what it has done, is doing, and will continue to do for students of our school corporation. Our school corporation is proud to be a part of this program. We know it is far from perfect, but at the same time we are ten years ahead of our time when we look at technology in schools similar to ours. Jac-Cen-Del looks forward to a long working relationship with the Buddy Project. We appreciate the support of the project, corporate sponsors, the Indiana Department of Education and the Indiana General Assembly. We welcome you or anyone to visit our school to see for himself the impact that this program has had on our students. In this case seeing is believing.

Sincerely,

R. Stephen Cookins
Superintendent

Senator BINGAMAN. The committee stands adjourned.
[Whereupon, at 12:05 p.m., the committee was adjourned.]

TECHNOLOGY FOR EDUCATION ACT OF 1993

WEDNESDAY, AUGUST 18, 1993

U.S. SENATE,
COMMITTEE ON LABOR AND HUMAN RESOURCES,
Albuquerque, NM

The committee met, pursuant to notice, at 10:00 a.m. APS Board Room, Technical Vocational Institute, Albuquerque, NM, Senator Bingaman presiding.

OPENING STATEMENT OF SENATOR BINGAMAN

Senator BINGAMAN. Good morning, and welcome to today's hearing on S. 1040, the Technology for Education Act of 1993. I believe that what you will see and hear today will make you a "believer" in educational technology and motivate you, as it has me, to press for creative ways to extend these innovative programs to each and every child in America.

Our goal with this hearing is to captivate your imagination—to give you a taste of the endless possibilities through technology to transform our Nation's classrooms into exciting laboratories for creative learning. We hope to peak your interest and stimulate your appetite for innovative uses of technology for our children, their parents and teachers.

Last month, we held a similar hearing on education technology in Washington, DC and the response was tremendous—both from the witnesses and the audience. If we have done our job right, you will walk away from this hearing with more questions than answers—more information than you can possibly process in these two short hours.

Before we go further, I would like to thank Dr. Ted Martinez and his staff here at the Technical Vocational Institute for hosting this hearing and providing the technical support to enable us to coordinate all this electronic wizardry with us today. I would also like to acknowledge similar efforts within the State to further technology in the classroom. Mr. Carlos Atencio, Chairman of the New Mexico Educational Technology Coordinating Council along with Mr. Kurt Steinhaus, Director of the NM Department of Education, Educational Planning Services Department, members of the New Mexico State Legislature and members of the ETCC has been working tirelessly to develop a State response to this Federal legislation and to develop their document "A road Map to School Improvement" in New Mexico. New Mexico is at the forefront of educational reform and I am pleased that Mr. Atencio has graciously agreed to provide written testimony for the record to document their efforts and their plan.

We have asked our first panel to focus on classroom success in New Mexico through technology. Our panel of students, teachers, administrators will give eye-witness accounts of how technology has changed their lives and opened endless opportunities to explore the world of learning.

The second panel will provide a hands-on demonstration of what is currently available in model classrooms within our State borders. Through the students and teachers we've asked here today, we will witness what exciting opportunities our State can offer to other schools across the Nation through technology.

We will see demonstrations of state-of-the-art equipment and complementary software packages—programs enabling teachers to tailor the curriculum to the swiftly changing flow of information and the individual needs of the students.

As you will witness today, creative uses of technology by skilled teachers can change our outlook on education—making teachers and students partners in the quest for knowledge and the process for learning. Our problem, however, is that too few of these examples exist in the classrooms across our Nation.

We could point the finger of blame to any number of factors; but for whatever the reasons, our job at the Federal level should be to ease the burden on the State and local schools and to provide leadership and assistance in their efforts to reach the ambitious national education goals by the year 2000.

S. 1040 provides the vehicle—the means—to funnel this support to the State and local level. Our bill is, by no means, the solution to the serious problem of inequity in our school systems across America. We believe, however, that we provide the first critical step.

This bill provides a vision and strategy at the Federal level, with funding to ease the effort by the State and local school districts to provide equipment, teacher training, and technical support, as well as incentives to develop the market for educational products—along the lines of what you will see here today.

I want to thank you all for your attendance, and I look forward to an excellent morning of discovery.

Senator BINGAMAN. Let's get started. I would like to bring up the first panel of witnesses which include Benito Casados, Executive Director of Educational Systems for the GALAXY Classroom Project, Christina Esquibel, Chapter 1 Teacher, Tierra Amarilla Elementary School, Tierra Amarilla, NM; Donna Fullerton, Las Cruces Take Home Computer Program, Partners in Learning Program; Dora Galvez, Parent at Washington Elementary; Erika Ewbank, Reading Teacher at Washington Elementary; and David Caffey, Clovis Community College; accompanied by Mike Chambers, San Jon.

STATEMENTS OF BENITO CASADOS, EXECUTIVE DIRECTOR OF EDUCATIONAL SYSTEMS FOR THE GALAXY CLASSROOM PROJECT; CHRISTINA ESQUIBEL, CHAPTER 1 TEACHER, TIERRA AMARILLA ELEMENTARY SCHOOL, TIERRA AMARILLA, NM; DONNA FULLERTON, LAS CRUCES TAKE HOME COMPUTER PROGRAM, PARTNERS IN LEARNING PROGRAM; DORA GALVEZ, PARENT AT WASHINGTON ELEMENTARY; BELINDA GALVEZ, STUDENT; ERIKA EWBANK, READING TEACHER AT WASHINGTON ELEMENTARY; AND DAVID CAFFEY, CLOVIS COMMUNITY COLLEGE; ACCOMPANIED BY MIKE CHAMBERS, SAN JON.

Mr. CASADOS. Good afternoon, Mr. Chairman and members of the Senate Committee on Labor and Human Resources. My name is Benito Casados. I am the Executive Director of Educational Systems for the GALAXY Classroom Project, the satellite education network dedicated to dramatically improving elementary education.

It is my pleasure to be here today to testify before you regarding what I believe this country can achieve for its youngest students by tapping the power that technology holds for education. I want to tell you briefly about such a program that is achieving real breakthroughs in teaching and learning in 50 schools in this country and on in Mexico.

That program is GALAXY Classroom, an initiative of the GALAXY Institute for Education, supported by Hughes Aircraft Company, the National Science Foundation, the Carnegie Corporation of New York and the Southern California Weingart Foundation.

Through this program we hope to address the great needs and provide services to an essential segment of American education—the elementary school.

Most of the Nation's elementary education classrooms are still in the dark ages. Students are being taught the same ways and with the same tools they were 50 years ago, with no opportunities to understand or relate to the world around them. Teachers are isolated in their classrooms. Schools are isolated in their districts. The only thing that has changed about elementary schools since I attended, in fact, is the color of the blackboards. Now they are green.

I have had a number of recent opportunities to visit the elementary school I attended in the mountains of New Mexico. Let me tell you what I found:

Little or no awareness of the power of technology as an instructional tool;

Some outdated Commodore computers, but no software to run them;

A very traditional curriculum devoid of technology and lacking relevance to the students everyday lives;

Teachers fatigued by the sameness of their teaching routine.

And that is not unusual.

Most elementary schools are not equipped with today's most common technologies—technologies that you and I have at our disposal at home and in the office. Most teachers have not been exposed to or trained to use technology and most school districts are so strapped for funds, they cannot afford basic materials and textbooks, let alone computers, fax machines or satellite dishes.

It is no wonder that we are turning out students who are not prepared for work, who don't possess critical thinking skills and who cannot compete in the technologically complex world that awaits them.

While significant attention and funding has brought high technology and its resulting educational benefits to secondary schools and higher education, the Nation's elementary schools have been neglected and largely forgotten.

Yet we are keenly aware that if we are going to turn around student achievement in this country, we have got to reach kids at an early age, when they are amid learning attitudes about education. If we miss them in their early education years—by the time they reach fourth grade—or changes are we will have lost them forever.

All the money we pour into secondary and postsecondary education is well and good, but it's like preaching to the choir. It reaches the believers, the achievers, the students already in the system. It doesn't do anything to bring more of our children into school to stay or to get young children interested and engaged in their own education.

The needs for educational technology are great.

Our classrooms need to be wired for voice, video and data. Our teachers need to be trained on the effective use of technology. Curriculum and technology need to be integrated to closely address the needs and of our student populations.

And the promises technology holds for our youngest students are even greater. Technology is a magnificent motivator and places students in an active learning role. It offers access to education for all students, some of whom live as I once did, in remote parts of this country. And others who face the daily struggles of inner cities. As with GALAXY Classroom, technology can be harnessed to help students who are considered to be "educationally at risk."

It offers the opportunity for all students to achieve excellence through high quality education. Technology can bring the very best resources and the best teaching and leaning tools and techniques into the classroom. And it can transport students in those classrooms into the world around them.

Technology creates lifetime learners and provides lifetime skills that students with need in the information age of the 21st Century.

And technology is cost effective. Technology is a long-term investment in education for today's and tomorrow's students. The Direct Broadcast Satellite receiver that will be at the heart of the GALAXY Classroom, for example, is about $700. One eighth the cost of today's traditional satellite receivers. By extending the information highway to our Nation's elementary schools, we are paving the way to real change and improvement in what our students will know, be able to do and achieve for themselves and our Nation.

Let me tell you briefly about the GALAXY Classroom response to those promises. The Galaxy Institute for Education, a nonprofit entity is responsible for the operation of the program.

GALAXY Classroom is a major corporate response by Hughes Aircraft Company, a company committed to making a difference in early education. They are committed to creating a more skilled and competitive work force. Hughes made a substantial corporate in-

vestment of $12 million to create a system that brings the best technological advances to improve elementary education.

That system is currently in operation in schools in East Los Angeles; in Tierra Amarilla, Mew Mexico; Hickman, Kentucky; Washington DC; Baltimore; the South Bronx; Holyoke, Massachusetts and 13 other cities in the United States.

The GALAXY Classroom aims to reach over 10 million students in 20,000 schools by the end of the decade. It combines the best in technology with innovative and exciting curriculum that helps students become active learners.

Our curriculum is available in English and Spanish, and our telecasts are closed captioned. Using satellite, fax, video network and computers, GALAXY successfully integrates very high quality video dramas with hands-on activities and materials including literature books, science kits, teacher's guides, parent tapes. It's a very conscious effort to bring the parents into the process of education.

The GALAXY Classroom has created a global classroom by bringing all these—right now, these 38 schools into a little community of its own. They communicate with each other; student to student; teacher to teacher via this satellite based network.

GALAXY Classroom is succeeding beyond our wildest expectations. Even though we've only been in operation for one semester, our preliminary evaluation results are very very very good.

Test scores show improvement. Teachers are reinvigorated and reenergized about teaching. They're motivated and excited about using technology as tools of the classroom.

Parents are aroused with new interest in what is happening in their schools, in the children's classrooms and want to be involved in education of their sons and daughters and, in many cases, their grandchildren.

Children who would not read or write before the program are now reading and writing prolifically. They have a new understanding of the geography of our country just by communicating with each other.

Attendance in some classrooms have increased dramatically. Just the sheer expectation that that student may receive a fax from a student across the country has motivated them to be in that classroom every single day of the semester.

Many problem children are no longer problems. They're becoming real active participants in the process of their education. They are beginning to perceive themselves with a positive self-esteem. And, for the first time, they are beginning to experience the satisfaction of learning.

I want to show you a little brief tape here that encapsulates the idea of the GALAXY Classroom and what we have started and what we hope to achieve as we implement this country on a nationwide basis. Thank you very much.

Senator BINGAMAN. Thank you very much. How are we going to do this tape?

Mr. CASADOS. It's set, and I think it's on the screen right there. (Video tape shown.)

Mr. CASADOS. Do you have any questions, Senator? I would be happy to answer them.

Senator BINGAMAN. Why don't we go ahead. Did Christina want to testify about how this has affected the way your school operates or the way your classroom operates?

Mr. CASADOS. Exactly.

Senator BINGAMAN. Terrific.

Ms. ESQUIBEL. OK. Thank you, Senator. My name is Christina Esquibel, and I am a Chapter 1 teacher at Tierra Amarilla Elementary School in Tierra Amarilla, NM.

Senator BINGAMAN. Why don't you pull that microphone a little bit closer, please.

Ms. ESQUIBEL. I truly appreciate this opportunity to tell you about my school and, in this case, the GALAXY Classroom because it's a lot of fun. And it's having a dramatic impact on Tierra Amarilla's teachers and students.

I was born and raised in Tierra Amarilla. I went out to school at New Mexico State, and I went back to teach at where I was taught. So I'm teaching with teachers that were my teachers. And that's a lot of fun. I was the first member of my immediate family to go to college also.

Our school serves our town and the neighboring communities of Canjilon, Los Ojos, Ensenada, Cebolla, La Puente and Los Brazos. Tierra Amarilla and its neighbors are considered poor. We have a hard time attracting new industry, and the parents of my students receive Government aid.

Many residents are county or State employees who work at the county jail or courthouse or for the State Highway Department. Some residents are ranchers. But, for the most part, ranching only provides supplemental income.

Many of the area's high school student graduates leave the area so that they can find jobs. I have considered myself lucky to have a good job and one that I enjoy too.

Tierra Amarilla Elementary School has 140 student in grades K through 5. Of these, 50 are Chapter 1 students which mean they receive special remedial instruction from me.

Federal funds such as Chapter 1 and Title 7 for bilingual education are very important to us. Without the instruction these funds provide, many of our students would be behind without much of a chance of catching up. Last year 18 out of 30 of the 5th graders were in my Chapter 1 class. So that's over half.

I think good educational technology can really make a difference in educating Tierra Amarilla's students. Our school is poor and remote, and few of our students get a chance to touch the world outside their community. And, for the occasional trip to Albuquerque, that's about as far as they get.

Our school is—our experience with technology has been limited, but is growing because of the GALAXY Classroom which came to our school early this year.

Galaxy picked Tierra Amarilla as one of its 40 demonstration sites. A lot of the sites are in big cities, but my school is one of a handful of remote sites that are testing this new program.

We also receive language arts and science programs over a satellite network that ties all the 40 demonstration schools together.

When students see GALAXY's telecast, teachers assign writing exercises or experiments. Students share what they have learned

with their peers at sister schools by faxing lessons. Our sister school is in San Pedro, California which is close to Los Angeles.

There are several other important things about GALAXY. One is that it has bilingual programming in Spanish and English. That is important to our community. It is also closed caption.

Second, GALAXY goes out of its way to reach children who are considered to be at risk. In just a minute I'll tell you how it has reached some of the outreach students in my own class.

It has themes that students understand, themes that explore peer pressure, fitting in and relationships with your neighbors. And students really identify with these things.

Now here are some success stories of some students that we have. Let me tell you about Jennifer. She is an 8 year old girl who is new to our school. She came in from, I think, Santa Fe. And she did not experience much success until she was exposed to the GALAXY programing and computers. This little girl loves computers.

At the young age of eight, Jennifer has had to take care of herself because her father is handicapped. She lives with her grandmother, and her grandmother is up in age.

In February, when Jennifer saw The House, one of GALAXY's first language arts telecasts, she identified with the characters who also have obstacles to overcome much like her own.

This program moved Jennifer to write and to draw both on paper and on the computer. Nothing else we tried succeeded, nothing. You should have seen Jennifer's face when she learned that other children experience problems, and you should have seen when she experienced some success.

I think this is what education is all about. It's about finding how we can turn our students into active learners and then helping them on their way.

Felix—Oh, Felix was in my class. Jennifer was in my Tia's class. Felix loves horses and four wheelers, anything dealing with the outside. He is an extremely active boy who wants to always be outside. However, Felix's reading scores, they're real low, and his writing scores are even lower. He was willing to do anything but read or write.

But, when he was introduced to GALAXY and our sister school and the kids at the sister school, Felix suddenly took an interest in writing letters to a little girl. She was kind of cute. And he's now a reader and a writer for one of the first times. And he was willing to do it on his own.

Last, Robert—Robert was a very unmotivated 4th grader. Robert wouldn't do anything. He wouldn't listen. He just sat, and he did nothing. But we introduced computers in the classroom.

Robert came out of his shell. He began to enjoy writing his own little stories, making drawings. GALAXY helped him by giving him an audience with the other children. And it took him out of the classroom by giving him an opportunity to fax his work to our sister school in California. He soon made excellent maps and added up to success for Robert, success he wouldn't have had otherwise.

He not only became an active learner, he succeeded in performing well in multidisciplinary tasks involving language arts and art in geography. And he learned about modern technology. He had a

wonderful imagination, but he wasn't putting it to use until he actually got his hands on the computer.

What I've seen is our children who have awaken and have many obstacles to overcome. The GALAXY program motivates children to read, write and discover by taking them out of textbooks and into their environment. Their environment then becomes global via the satellite. It also encourages computer literacy in all students which is important now days.

GALAXY has also made a big difference in my professional life and the lives of our teachers in the school. We have learned how technology can work for our students and our staff. We have been exposed to new themes, new educational approaches and new materials. We have also been exposed to technology as a way of communicating with teachers whose concerns are similar to ours.

GALAXY has had a great approach to teacher training. It invites the GALAXY teachers to special institutes in places like Los Angeles, Atlanta and San Jose and teaches them how to use curriculum and technology. In doing so, GALAXY gives teacher training a whole new meaning.

I think my Tia Rose who lives with us—who I live with and who I teach with says it best, "For 15 years I've been a traditional teacher using textbooks and extending skills the same way. GALAXY though has opened a different new world to me." And I've seen her just totally bloom, and it was neat.

I want to, again, thank the Chair, Mr. Senator, and the Committee for this opportunity. I'm glad I had the chance to tell you about my school in GALAXY Classroom.

Senator BINGAMAN. Thank you very much. I think it's exciting what you're doing there. I'll have some questions for both of you after we get through with the other witnesses.

Why don't we hear from the Partners in Learning Program, the Las Cruces Take Home Computer Program. Donna, do you want to start?

Ms. FULLERTON. Thank you, Senator. Our project is very different. We are starting into our fifth year. The Take Home Project started with 50 computers being sent home with families, and now we're up to 200 computers. We serve 800 families approximately a year.

We are not just targeting the Chapter 1 children. The purpose of our program is really threefold. It serves, yes, the Chapter 1 child that's identified with special needs in math and reading. We also focus on family involvement and community involvement.

A portion of the project was founded a little over 5 years ago with six business partners that came into partnership with the public schools to begin this project.

I think it would be appropriate to begin with our video, and then I'll—This is an abbreviated version and focuses somewhat on the partnership and a few details before we hear from them.

Senator BINGAMAN. Great. Let's watch the video.

(Video tape shown.)

Ms. FULLERTON. As you can see from the video, we got off to a wonderful start community-wise with our six partners. They originally came out and helped us pick the computers out and parent-child training.

These trainings turned out to be one of the best things that happened to us for families. We had the opportunity to relate to them on a one-on-one basis. Our liaison sat down and talked.

They offered these workshops that were mentioned in the video. It gave the chance for families to feel like the school district is very in tuned to them and their needs. They feel very trusted to have a computer in their home.

We know that our test scores are showing results. This is important to us. But part of it that we cannot show is what's happening with the family issues. There probably are many children that are getting software at home. By the way, we send software for any children in the family, K through 8, not just the Chapter 1 child. We don't know how many of those children may never be Chapter 1 children because their achievement has been such that they don't qualify for extra help.

We don't know how many families we have provided enough help for that they're able to apply for jobs. We did have a parent come up and tell me not long ago that his wife learned enough English and math to get a job at Leggs because of his child's computer at home.

So there are so many things that we can't actually measure. The reports that you have really are reflecting what's measurable.

But the nonmeasurable things also include the fact that families who are very uncomfortable, perhaps, in the educational setting are becoming comfortable.

They are willing to come in and sit down and talk about it. They are willing to tell us what they would like to see happen. And they are willing to become a partner in what is happening.

It's a gradual change. But in our fourth year we're seeing more and more real acceptance to becoming part of the system.

I'd like to hear Belinda's comments now on how she feels about having a computer at home.

Senator BINGAMAN. Why don't you tell us, Belinda, what your thoughts are. Do you get to use the computer at home?

Ms. BELINDA GALVEZ. Yes.

Senator BINGAMAN. What do you do with it?

Ms. BELINDA GALVEZ. I do my math on it or English.

Senator BINGAMAN. Why don't you—I think the one—the microphone that you're using is not the one that allows anyone back in the back to hear, so why don't you pull that other one up instead, if you can, and just talk into that. Tell us what grade you're in.

Ms. BELINDA GALVEZ. I am in the 5th grade.

Senator BINGAMAN. You have some programs that help you with math that you use on your computer?

Ms. BELINDA GALVEZ. Yes.

Senator BINGAMAN. What kind of programs? What do you do in the 5th grade in math? Multiplying and dividing and that sort of thing?

Ms. BELINDA GALVEZ. Yes.

Senator BINGAMAN. How do the programs help? Do they give you practice or what?

Ms. BELINDA GALVEZ. They, like, help me study so that way I can do better in school.

Senator BINGAMAN. That's great. Do you use any other courses besides math or is that the main one that you're using the computer to help with?

Ms. BELINDA GALVEZ. I use enrichment more.

Senator BINGAMAN. Enrichment? What is enrichment? Is that——

Ms. FULLERTON. It is a variety of different activities that really focus on problem solving in higher level skills.

Senator BINGAMAN. OK. That's not video games, is it?

Ms. BELINDA GALVEZ. No.

Senator BINGAMAN. That's what my son does. I try to get him to use the computer. I always catch him playing video games on the computer.

Well, that's great. Do you think it's been a good thing to have it at home?

Ms. BELINDA GALVEZ. Yes.

Ms. FULLERTON. Do you have any brothers and sisters?

Ms. BELINDA GALVEZ. Yes.

Senator BINGAMAN. How old are your brothers and sisters?

Ms. BELINDA GALVEZ. My oldest sister is 26, and my brothers—one of my brothers is 23, and another one of my brothers is 19, and my sister's 17, and my other brother is 11, and my youngest sister is 4, and my other sister's 8.

Senator BINGAMAN. Which one of them uses it the most? Are some of the others using the computer also?

Ms. BELINDA GALVEZ. Well, my little sister uses it the most.

Senator BINGAMAN. The sister who's, what—the one who's 4?

Ms. BELINDA GALVEZ. Yes.

Senator BINGAMAN. What does she do?

Ms. BELINDA GALVEZ. Kindergarten math.

Senator BINGAMAN. Kindergarten math. That's great. That's terrific. Thank you very much for being here and telling us about it.

Ms. FULLERTON. Belinda's an example and Dora also of the many families who have come back to us with the idea that we really really appreciate the idea to do this, and we like the idea that our whole families are involved.

Another aspect of the family that we consider very important is that when we do the parent-child trainings we have a chance to really deal with the idea of really establishing good study habits and finding alternative activities for kids.

Parents want to do these things, and they really appreciate that we provide some resources to help introduce this habit. Many times families are not really aware of the need for, perhaps, that kind of support at home. And many have come back and said, "We've set aside a regular study time because we have a computer at home, and we did that."

They also like the idea that if they are not doing as well as they'd like to see their children do at school that there are ways to deal with it themselves and become involved.

So I think one of the directions that we are heading is to do more and more emphasis on the family issues. Our families are under tremendous pressure. Surviving in today's economy is a lot of times more than we can cope with. They really need to feel that we're

there for them too and that we're a team. And this concept is going over more and more.

Dora, are you ready to share with us?

Senator BINGAMAN. Can you pull that microphone up, Dora, close there? Does it reach or not? Maybe the other one's got a longer cord.

Ms. DORA GALVEZ. Good morning. My name is Dora Galvez, and I'm a parent at Washington Elementary. I have been a parent from more than 20 years, so I'm still going to be there for a couple more. I have eight children. And I have four graduates. And three of them are going to New Mexico State. And one of them is going into accounting, and two of them are going into engineering and technology I hope. They're very interested in doing that.

So I try and help my kids, take advantage of anything we have. And I am a believer that there's money there. You just have to use your brains to go get it if you learn all you want, all you can.

I think that has helped me a lot. It has given me confidence in seeing—when my 4 year old uses the computer, I see the shine in her eyes. And I think it's so pretty and just—I'm very emotional.

I appreciate everything I have and everything that Donna and everybody has done for me. And a lot of the families have enjoyed having the computer at home. They have many things to say. They just don't know how to say it. And I'm learning how to speak a little bit more.

And the neighborhood—the children from the neighborhood they all know that we have the computer, so they go and visit us a lot. They say, "Let's go play outside." And my little girl tells them, "No. Let's go use the computer." We're the important neighbors there because we have the computer.

My 2 year old grandson likes to use it also. And I see that they feel competent in going to the computer. And they tell me, "Here, Mom, this is how you do it." We have a little engineer. He's 11. And he says, "If it breaks, just call me." And this has given him the confidence of knowing that he can use it. Anybody can use a computer. And they told me how to do it.

So having it there—having the computer at home and using it, you know—like, they don't use it all day long, but they take turns. They take turns using it. And, like I said, anybody that goes to my house can use it.

Like I say, my 4 year old, she's learning how to write her ABCs from seeing all this in the computer, and she can identify letters and pictures from seeing this in the computer. Having this there also helps a lot. And I think it's just being able to say I can do it.

If our children learn very young that, yes, they can do anything they want, you know, that's good for them. They are able to do it because they have the computer there, and they have access to it. They can use it and touching it and knowing that it's not going to break just because they push a couple of numbers and that it's not going to break and, yes, knowing I can do this.

And my children, they're very outspoken. She's just nervous. I think that having this at home, you know, makes them feel that I can do it, you know, I can do it. All my kids are going to be doctors when they grow up. And I say you can be anything you want

thanks to Chapter 1. We have been very grateful for them. There are many many parents that are very grateful.

And I wish there was more. We need more computers because there are a lot of kids who would benefit from this. And I truly believe that we need more computers. I can say that it's given me a lot of confidence. Just being here has proven to me that, yes, I can do it.

Senator BINGAMAN. Thank you very much for telling us about your experience with it. It sounds like a wonderful program.

Ms. FULLERTON. Thank you. Our teacher from the program is also here to say a few words.

Senator BINGAMAN. All right.

Ms. EWBANK. Hi.

Senator BINGAMAN. Hi. I'm glad you're here.

Ms. EWBANK. I'm Erika Ewbank, and I'm the reading teacher at Washington. And I just basically want to say that I think that the Take Home Computer Program has really been wonderful, not only with our students—although you can see a change. They feel more self confident. They feel like they can perform successfully at school—but our parents walk away with the same feeling.

You know, at least in our community, there aren't very many computers in the homes. And there's also this fear surrounding computers. It's technology: I can't do that. I'll break it.

And a lot of our parents are finding out that they can turn it on. They can troubleshoot. And a lot of parents are learning English from the programs. And we have had a few that have been inspired to go on and complete their own education. And talk about serving as role models for their own kids as far as education goes. So I'm real impressed with it, and I'd like to see it continue.

Senator BINGAMAN. That's great. Thank you very much.

Donna, do you have anything else to go through here? I'll have some questions after we get through with the other witnesses.

Ms. FULLERTON. Thank you, Senator. I think what these people say is the most important message we can send. I think the other point I'd like to make with this is—I'm sure you're very aware of our limitations and numbers of people we can serve through Chapter 1, and we have extended these services to many more children through the Take Home Project.

The buildings can be elected to serve either the greatest in need students by serving them double; whether they're getting our lab services or in-class services and the Take Home.

They can reach grade levels that they weren't able to reach at all. Maybe they're serving 4th and 5th grades with just Take Home, and those children would receive no services otherwise or other children who are perhaps not on grade level, but not low enough to ever qualify for help. And, when they are low enough, we finally help them.

In many cases, we feel that a lot of those children are showing up on our list as being a year or so behind. And, after having a computer at home maybe twice, we're finding out that these children are no longer showing up on Chapter 1 roles. So we're extending the Federal Law that we already have by the Take Home Program.

Senator BINGAMAN. All right. Thank you very much. That's great.

Our final witnesses on this panel are going to talk about Distance Learning and more specifically the way it's been implemented over in the east side of the State.

David Caffey who is with Clovis Community College and Mike Chambers of San Jon are here to talk about their efforts. Go ahead. You might pull that microphone up also, if you could so that people in the back of the room could hear you.

Mr. CAFFEY. Thank you. Senator Bingaman, we thank you very much for your interest in and encouragement of Distance Learning in Eastern New Mexico.

Clovis Community College is very pleased to participate with member schools of the Eastern New Mexico Instructional Television Consortium as provided or post secondary educational services to the consortium.

The school districts that we work with are located in Clayton, Roy, Mosquero, Logan, San Jon, Taos, Santa Rosa, Grady and Fort Sumner.

Through the interactive fiber optic link provided by the Eastern New Mexico Rural Telephone Cooperative and in cooperation with these school districts, Clovis Community College offers courses to high school students who are currently enrolled in their high school for high school graduation credit and who are earning college credit through Clovis Community College.

We also through our system support a pilot project with the New Mexico Department of Labor which uses our free hours on the system to provide client services, client intake and informational services for the State Department of Labor.

That has also generated some interest on the part of the New Mexico Department of Human Services to do a similar thing. And another potential that we're exploring is offering graduate courses in education to meet the in-service needs of teachers in the school districts that are served by the system.

There's a new book just out this year called Miles from Nowhere, Tales from Americas Contemporary Frontier by David Duncan. And in that book the author examines the unique experiences of rural residence of counties with population density of less than two persons per square mile which was the Census Bureau's 19 century definition of a frontier area.

The author of this book identifies some 132 counties with a population density of less than two persons per square mile in 15 states in the Western U.S., and he calls those the contemporary frontier.

Six of those counties are in New Mexico, and four of those six are in the six county area that is served by Eastern New Mexico Instructional Television Consortium.

These are areas in which higher education facilities are never likely to be available physically on-site, and they're also areas in which the economies of scale often don't allow the local school districts to offer the array of courses and some of the advanced courses they would like to.

So the advent of the fiber optic link means that these areas can have access to an abundance of new educational and technological opportunities. Clovis Community College is still a Community Col-

lege. We don't have dormitories, and we don't recruit State wide or regionally or nationally. We concentrate on our community.

But, with the availability of the fiber optic ITV network we can define community more broadly to encompass the area served by the nine school districts with which we work.

In education there is no such thing as a technology project only. Any worthwhile innovation must be, first of all, an educational project with a valid educational need; in our case, delivery of post secondary and high school enrichment programs to the rural schools in Eastern New Mexico.

Second, it's a people project. It's hard enough to work together with ten offices on the same campus. But, when people are working together in a Community College, nine school districts and Eastern New Mexico Rural Telephone Cooperative, it's important that the people be able to work well together. And we've been able to do that. So it's a people project.

And, third, it's a technology project in which we work together to demonstrate that a new technological opportunity can be successfully applied to an educational need. There are technical, organizational and public policy issues that must be addressed in order for the ITV system to achieve its greatest potential benefits.

However, we're extremely gratified and encouraged with the success of the students who have been able to realize the benefits of the project in its first 3 years of operation. And we look forward to the growth and improvement of Distance Learning opportunities in the future.

Did you want to go ahead and look at the video now?

Senator BINGAMAN. Whatever you—if you've got one that we should see, let's do it.

Mr. CAFFEY. This is an excerpt of a 30 minute video that was made by the Southwest Educational Development Laboratory of Austin, Texas. It covers four rural Distance Learning Projects in New Mexico, Oklahoma and Texas. So this is the segment that is about our Eastern New Mexico project.

(Video tape shown.)

Senator BINGAMAN. All right. Thank you very much.

Mike, did you want to add anything here?

Mr. CHAMBERS. Thank you, Senator. I'd like to add a few things. And what I might say is slightly repetitious. But, first of all, let me bring you greetings from your friends over on the Llano Estacado and appreciate the opportunity to visit with you again about our project.

I'm here today to represent a group of nine superintendents and nine local school districts who make up the consortium which David referred to earlier known as the Eastern Plains Instructional Television Consortium.

This council was created so it better could utilize the ITV system in our communities. Initially this project was a pilot project funded by the Eastern New Mexico Rural Telephone Cooperative which David also mentioned.

Initially their interest was twofold; number one, to help public schools to do anything within their power to expand opportunities for students, but also to help ensure that local communities are able to keep their schools open which, as you well know, here in

New Mexico sometimes meets the difference between a community surviving and not surviving.

The State Legislature has since acted to fund the project by repaying the equipment cost for the three schools—or excuse me, for the five schools that were initially on the system and purchasing equipment for four additional schools that are currently on the system.

Our system is a complete two-way communication system which operates via fiber optics telephone line. Our goal, as a council, has been to provide as many expanded opportunities for students as we possible can.

Secondary to that, there has been an attempt to utilize the system to provide staff training for our teachers and also to provide community services to members of our community.

We have been able to accomplish all of these to a large degree and are always looking for more and better opportunities to do so.

The system was initially designed to allow for rural schools to be able to provide instruction from one rural site, originated from one site, and receiving instruction in several others.

Since then, the system has been expanded to allow Clovis Community College to provide college classes for our students during the day, as well as college classes to community members during the evening.

Currently, during this semester, Clovis Community College will be offering four classes during the daytime and six classes in the evening. All of which can be accessed by students and community members without having to drive those 100 to 300 miles round trip which would be entailed by the various communities.

In addition, as David mentioned, the council and the schools have entered into an agreement with the Department of Labor and the pilot project that was mentioned. Other projects which have also been done include the State Mandated Child Abuse Training for our teachers, the ACT/SAT preparation for students to help them with those tests, firefighter training for community members, coaches preparation classes for staff members and other various projects.

Future plans include study skills classes for students and also look to increase the opportunities for college classes for students as well.

The benefits of the system to small rural districts here in New Mexico have been varied and many. One of the best examples was last year and in several years past there was a movement in the leadership of State Legislature to look at consolidating some of our 88 school districts into larger districts. And obviously we resisted that to a large degree.

And the two most heavily cited reasons for doing so was saving money and, second, to be able to provide opportunities for students that they do not believe were being provided in small schools.

This project has helped us to answer that charge and to be able to tell the State legislators that we are doing those things for kids and that we are offering those opportunities, not only the same opportunities that kids get in some of the larger schools, but even more opportunities.

We'll actually have students graduating from San Jon School this year with 30 hours of college credit which they have been able to take completely free of charge. And, you know, that's over a year or about a year of their are college instruction.

And all of these classes are basic college classes which not only offer some challenge and enrichment to those kids during their regular school time, but also will transfer to any university in the State, and they'll be able to start their programs when they decide to enroll in college. So it's been an excellent opportunity for serving students.

I see three real basic needs right now with the program. No. 1, somehow we—and David will allude to this—somehow we have got to have some type of a commission that is going to regulate the laws concerning transmission of programs for educational programming.

If we were to have to pay transmission costs on a regular fee basis right now, this program would cost us well over a $100,000 a year. And we simply cannot do that. The fact that it's operating now on a pilot basis now by ENMR is great, but we don't know how long it's going to last. And somebody is going to have to deal with those issues.

No. 2, we need a plan to address where and how best to present the educational opportunities to not only students in Eastern New Mexico, but all students. And I know that's a great desire on your part, Senator Bingaman.

And third, sources of funding for maintenance and upkeep of the existing equipment and also to improve the equipment as new advances are made.

Once again, I and the others of the EPITC and the newer students that we represent stand in favor of this bill, Senator, and we appreciate your concern and the efforts that you and the other members of the committee are making toward this end. Thank you.

Senator BINGAMAN. Thank you very much. We're running way behind time. We've got another panel. Let me just ask each of the groups here a question or two, and then we'll have to go to the second panel.

On the GALAXY program, I'm very impressed with what I hear. I'm also struck by your plans for expansion. You have a very ambitious plan. You said you want to reach, what, ten million students?

Mr. CASADOS. Ten million students.

Senator BINGAMAN. By what year now?

Mr. CASADOS. By the end of this decade. Senator Bingaman. How do you propose to expand it? For example, if I were a superintendent in a small school district in New Mexico and wanted to participate, is it possible to apply to participate? Or how do you—how do we get more people to get the advantages that they're getting out in Rio Arriba?

Mr. CASADOS. The way we envision this program being made available to all schools is to charge a subscription. And that subscription would be less than what we today pay for a traditional textbook. So it would be—each student would pay approximately a little under the price of a textbook. So it would be on an annual basis that we would charge for the delivery of programs.

Right now we are working the pricing structure. But we think that as we expand and get a great number of schools involved that the price will start dropping dramatically because of the scale of which we can deliver the program on a nationwide base.

We are aiming to make it very very affordable and keep it very very high quality. It's really important that we maintain a high quality and keep it very affordable.

Senator BINGAMAN. Is the broadcasting, in any way, interactive or is it just a broadcast and they have materials that they have been sent in anticipation of it? How does it work?

Mr. CASADOS. We have a different definition of interactive. The television program itself is what we call network quality. For the elementary student it has to be a very high quality programing.

It's like a story line with characters that in that program we have embedded all the instructional strategy that the classroom teachers use. The interaction occurs after the program is viewed. So interaction occurs by students interacting with the actors afterwards, by students interacting with other students, by teachers interacting with other teachers.

And, since we are broadcasting across time zones, we are not expecting for that one-on-one interaction. Our programs are not the tradition Distance Learning programs where a teacher teaches over the system. That we feel is not appropriate for the elementary school program, for the elementary school student or the elementary school teacher.

The elementary school instruction has to be a tool for the elementary classroom teacher, and it cannot be—it's not appropriate, we don't believe, that it be a teacher teaching over the tube.

Senator BINGAMAN. OK. Did you want to add something?

Ms. ESQUIBEL. I think on October 14 we are having what we call a launching, and that's where we invite—and our school's so small—we invite statewide—and we're planning statewide, like the Las Cruces schools, the administrators, whoever may be interested to come and see how it actually works.

We're going to show you the hands on and how we do it and show you—introduce you to the GALAXY Program. And that way, if you're interested, you'll be able to buy into it.

Mr. CASADOS. We're launching a science program on October—we start the broadcasting September 27th, but we're having the big hoopla, I guess you could call it, on October the 17th.

Each school conducts its own open house and illustrates to the community how the GALAXY Classroom Program works.

Senator BINGAMAN. All right. It sounds very exciting and ambitious. I think it's great that you're planning to extend it as you are.

Mr. CASADOS. We think that the only way it's cost effective is to do it on the scale that we want to do it. And it's a nationwide delivery system. The satellite gives you that capability.

And ultimately the system may be a hybrid system where we use satellite delivery and local telephone systems to create that interaction that we think is very important.

Senator BINGAMAN. Thank you. Let me ask Donna something about your program, your Take Home Computer Program. If I were a parent in your school district and was able to buy a computer for our home and wanted to use the computer and have my child use

the computer in order to enrich their instruction in school, are you geared up to help me do that?

Ms. FULLERTON. Most likely. Assuming that your computer is compatible with our software, yes. We do, in some instances, just sent software home in order to help.

Senator BINGAMAN. Is that mike on? I don't think it is. Can you folks hear her back there? Well, maybe it is.

You say that you are geared up to do that and, in some cases, send software home which supplements the textbook material and assists any student, whether they are participating in this particular Take Home Computer Program or not?

Ms. FULLERTON. We really are not putting it out for all students simply because we couldn't possibly keep up with the volume. I'd say we're 99 percent within the Chapter 1 qualifying students when we do that. Occasionally we have a special issue we address, yes. Senator Bingaman. It seems as though even for the students that are not Chapter 1 and for the parents of students that are not Chapter 1 there might be a real interest in trying to have their children use the home computer to supplement the actions—the activities going on in school.

I think this is one of the big issues that Chapter 1 faces all the time is that we would very much like to be supporting a larger population with some of our efforts, and more and more we're seeing the Federal Guidelines allowing us to do this.

Senator BINGAMAN. So, when we rewrite the Elementary and Secondary Education Act next year, we ought to be sure that you have that flexibility.

Ms. FULLERTON. We'd like that flexibility, yes. Right now the regulations allow us to use existing equipment and resources if it does not displace a Chapter 1 child, and we do that when we can do it.

But, in this situation, the Feds really give us very little room to say, "Yes, we can serve your child when, in fact, it might take away from a Chapter 1 child."

So we do it as we can. And we're appreciative of that opportunity. It wasn't even there 5 years ago. So we're much more flexible now. But, if we could have a little more room, perhaps we could be a little more effective.

Senator BINGAMAN. Good. Glad to hear about it. All right. Let me just ask, on your activities over at Eastern New Mexico, the points you make about having a commission or an entity that regulates transmission of programing so that you can do this on a cost effective basis I think is absolutely crucial. And we've talked to the commission that Carl Atencio is heading up and have talked to US West people and to various other telephone operators about how we get that done. We're still working on that. I agree with you that that is an absolute essential need.

Have you folks looked at using your system to broadcast into any of the schools the programming that comes from out of the State rather than everything that's originated there at Clovis Community College?

I mean, for example, in South Carolina, they've got that national network that they operate out of the South Carolina school system that I think 20 something odd states have signed up to.

Have you thought about using your system perhaps to broadcast that kind of instruction too?

Mr. CHAMBERS. Yes, Senator, we have. And, in fact, we have looked into the possibility and have just now been made aware of the possibilities of really picking up anything that comes in on the CU or KU band satellites and actually being able to take that in at Clovis Community College and rebroadcast all of those programs out to the various schools. And so that certainly is feasible, and that is one of the expanded opportunities that we're currently looking at.

Senator Bingaman. That's great.

Mr. CAFFEY. Technically I think there's no problem with that. We are advised that some of the same regulatory conditions that hinder us otherwise currently would perhaps hinder us from that sort of thing. But it's certainly technically feasible, and it would be a shame if we were not able to take advantage of that at some point.

Senator BINGAMAN. You know one of the things that you alluded to, and I just want to finish my questions by emphasizing this: I do think that there's no reason in the world why we couldn't do what you're doing in terms of providing courses in all of our high schools in New Mexico for students that want to take them in foreign language and advance placement courses.

And I go around the State and do student seminars every February for high school students, and I always ask—at least I have the last couple of years—how many of these students have the opportunity to take advanced placement courses. Usually the only kids that raise their hands are the kids from Albuquerque and the kids from Roswell and the kids from Las Cruces, in Santa Fe to Los Alamos. But you get out to the rural towns or communities, and they don't have that opportunity.

Now, you're changing that in your districts. But we need to change it in every high school in this State. And there's no reason we can't. It's not a big deal—it's not rocket science anymore to get these interactive advance placement courses beamed into those high schools, so that if there's one student or six students that want to take them, they can.

Anyway I compliment all of you for the great programs you're involved in. I think it's all very exciting. And I'm glad to see it happening here in New Mexico. I wish I had more time to ask questions of you, but we need to get on to these other three panelists. Let me make two more announcements here as the second panel comes up.

Let me introduce the second panel. We're going to have Jane Brighton, teacher at New Mexico School for the Deaf. She is going to demonstrate Media Literacy Project with two of her students, Angelica DePaula—I guess three of their students, Kathy Valencia and Tom Tischler. We're also pleased to have Arden Coleston. Arden is here interpreting for the deaf today. We appreciate his help.

Then we're going have a demonstration of the Teachnet Bilingual Education Program being used at Nob Hill Elementary School. And Lucy Holloway from Josten's Learning will show us how that program works. OK.

Then we're going to conclude with a demonstration from the Academy of Communications, Arts, and Technology at Santa Fe High, Consuelom Gonzales, a teacher at the high school and her students, Justin Lathrop, Frank Cox will provide oral comments while Cameron Stoker manipulates the equipment.

Let me also just mention that two of our interns in our Albuquerque office this year also helped tremendously with getting this effort going here, and I want to publicly thank them: Elizabeth Dewitt, back there standing up, and Chris Stone who's been over here getting all this equipment working for us on these demonstrations. I appreciate the good work.

I want to mention one other thing. For any of you as you leave or after this is over with, we have been very fortunate today. The Mobile Technology Vehicle which is operated by the Cooperative Education Services here in New Mexico and is owned by all 88 school districts, as I understand, is out front and is available to show you what they do. They take their technology all around the State particularly to rural districts and acquaint the teachers and students with what can be done with using technology. It's the only program of its kind in the country. We're very excited about it. And we want everybody here to be aware of it and get them into your school district if you haven't already.

Why don't we go ahead with the second panel. Thank you very much for being on the first panel. I guess what we want to do is start with the School for the Deaf, Media Literacy Project first and then go to the Nob Hill Elementary School second and then, third, to the Santa Fe High School.

OK. Why don't we start. Is Jane Brighton here?

STATEMENTS OF JANE BRIGHTON, TEACHER, NEW MEXICO SCHOOL FOR THE DEAF, ON BEHALF OF THE MEDIA LITERACY PROJECT, ACCOMPANIED BY ANGELICA DePAULA, KATHY VALENCIA AND TOM TISCHLER, STUDENTS; ARDEN COLESTON, INTERPRETER; LUCY HOLLOWAY, JOSTEN'S LEARNING; AND CONSUELO GONZALES, TEACHER AT THE ACADEMY OF COMMUNICATIONS, ARTS, AND TECHNOLOGY AT SANTA FE HIGH; ACCOMPANIED BY JUSTIN LATHROP, FRANK COX, AND CAMERON STOKER, STUDENTS

Ms. BRIGHTON. Hi.

Senator BINGAMAN. Hi. I can barely see you behind all the equipment. Why don't you pull your microphone up there and tell me what we need to know.

Ms. BRIGHTON. Excuse me, Arden, do you want me to sign for myself or do you want to interpret for me?

Mr. COLESTON. I'll sign.

Ms. BRIGHTON. That would be a little bit easier I guess. Thank you for inviting us to the hearing. I'm Jane Brighton, a high school teacher at the New Mexico School for the Deaf in Santa Fe. It's a residential school that serves pre-school through grade 12. We serve all students in the State that wish to attend.

Our school is not in session yet, but I persuaded three students to come today: Kathy Valencia from Pecos, Angelica DePaula from Santa Fe and Tom Tischler from Santa Fe. Kathy will be a Freshman, and Angelica and Tom will be sophomores this year.

I'm one of 15 New Mexico teachers involved in a pilot project to further Media Literacy. Hopefully the project will spread nationally. I want to show you some of the ways that Media Literacy is being achieved in other schools.

We define Media Literacy as the ability to access, analyze, evaluate and produce information through a variety of mass media forms and technology.

And, first, I would like to talk a little bit about accessing media. For deaf people there must be several adaptations for them to access media with sound component obviously. Some of them are obvious like a sign language interpreter or a hearing aid.

I'd like to talk about how the deaf access video and television. The main way is through captions or subtitles. And there are two types of captions. The first type is open captioning, and that's been in existence a long time. That's captioning that remains on the video; for example, foreign language films that are subtitled.

And I would like to say something about the excellent program that the United States Department of Education has had since 1958, very old tech program. It's an excellent program called Caption Films and Videos for the deaf. That's a collection of educational and entertainment films which are supplemented and updated yearly.

And they're free of charge to any hearing impaired person who wants them or to schools for the deaf. And these videos and films are kept in depositories throughout the United States. They're readily available. It's just an excellent program.

And each educational film comes with a lesson guide. And every year they publish a catalog of their materials. Tom.

Mr. TISCHLER. We'd like to show you films about reptiles. Some of the reptiles are extinct now. But there are five groups of reptiles that are still alive today.

Ms. BRIGHTON. This is just an example we're going to show you for about a minute and a half, something from the Department of Education. (Video tape shown.)

That was just an example of the very good open caption material that's available. However, even more important is closed caption television. It's just something that has revolutionalized the lives of deaf people since the 1980s. So many programs are available now in closed caption form.

In case people don't know closed caption materials, there's a caption that—there is a subtitle, but it can only be elicited with special decoder or a television that has that computer chip built in to decode the caption.

And Congress has passed a law recently which mandates that all televisions built after 1993, July 1993, will have the chip built in. So everyone will have captions at no extra charge if they want to see them by turning on the switch.

And incidentally the closed caption technology is going to be very useful for people who are not deaf; for example, remedial reading students, children who are learning to read. Perhaps there will be captions in foreign languages of English films or from other languages too. So I think it's going to have a lot of impact on many different groups.

In case you don't know, if you want to know if a program is captioned or not, in your television guide, there will be the letters CC or this little caption symbol. You've probably seen that.

And, if anyone is interested in borrowing a telecaption decoder, the School for the Deaf will lend those to people who would like to try out the technology.

So far I've talked about how the deaf can access mass media using special adaptation, but truly medial literate people should be able to produce media as well. And we do that at school through participating in News 101. That's the Emmy award winning program of KRQE in Albuquerque in which students produce news segments. We've been in that almost from the beginning, as has Consuelom from Santa Fe High School.

We also write media into our curriculum as much as possible. For example, last summer we had a video workshop during which we studied Pecos Pueblo and its history. And Angelica and Tom participated in that workshop.

First of all, we studied just conventional literacy, books, about Pecos Pueblo and had lectures, and then we made some field trips to the monument, and we video taped there.

And, then, in the fall, my Southwestern History class continued the project, and we made a documentary, and we added our own captions with special computer software that we have in the school that was too cumbersome to bring today to demonstrate.

Angelica, would you like to say something?

Miss DEPAULA. I enjoyed the video taping at the Pueblo. And also last year I had the opportunity to go to Gallaudet University in DC for a special program. And we were able to learn about the Native American culture. And also there's a video tape I'd like to share with you. And it's a short video tape.

Ms. BRIGHTON. It's is of the documentary that we made. It's 2 minutes. (Video tape shown.)

Those are some examples of the kinds of things we're doing. And we want to thank you again very much for inviting us.

Senator BINGAMAN. It sounds very exciting for what you're doing. I want to thank you for being here. I want to thank all the students for coming especially when they're still on vacation. That takes a little extra commitment.

Why don't we go ahead and hear about Nob Hill Elementary School. Lucy Holloway who is with Josten's Learning, why don't you describe what you're up to.

Ms. HOLLOWAY. My name is Lucy Holloway, and I do work for Josten's Learning, but I haven't always. I used to teach for 8 years utilizing Josten's technology in the classroom. Now I teach teachers on how to integrate and implement successful technology programs into their classroom.

I'm very excited to be here to demonstrate one of the programs that is in over 10,000 labs across the United States. Some of the New Mexico sites include Santa Fe, Roswell, Ruidoso, the Navajo reservation, Albuquerque area. We have many sites here in New Mexico.

This program, the Spanish Language Arts Bilingual Program, is a new program, and it's based on the national language acquisition series. This program uses interactive stories as the basis for stu-

dents supporting their emerge of literacy in their nature language of Spanish.

The students progress through units that expose them to stories that are from Hispanic folk tales and legends as well as classical and contemporary Hispanic authors. The letters and selections, as well as the activities and offline activities, are based on Hispanic culture and are not translations of English literature.

The SLA program provides a dynamic volition for a bilingual classroom. The program, as you look on the top here, is designed to work in three stages.

In the first stage, there is emerging literacy being developed at both the English and Spanish level.

In stage two, they continue their language development in their primary language of Spanish while they begin to develop English proficiency skills.

In stage three, they continue language development in a parallel manner in both languages. We do not take away if they do not speak English anymore. We're going to start teaching them how to read English. We develop their language skills in both languages through three stages.

This program of three different components: SLA which is the Spanish Language Arts Program, the ELD which is the English Language Development and ILA which is the Integrated Language Arts which allows teachers of different classroom models to implement lessons that will best meet the needs of individual students developing on where they are in their level of language development.

If they are at stage two, they can begin using the ELD and the ILA components. They can begin developing their English proficiency. If they're in stage one which means they are completely Spanish speakers, they can use units that are totally in Spanish for them as they begin to develop their language development in English.

Again, we do not take their native language away from them. We develop it at the same time that we develop their English language. We're going take a short view of one of the Spanish units.

In stage one, we have units that are all in Spanish, but the themes that go across match the same themes that are in English.

If we look at theme two which is counting, there is also a unit in the ELD component and a unit in the Integrated Language Arts component that have the same theme.

So even though we're using different pieces of literature and different languages, we are working on the same theme throughout the classroom. This allows the teacher to utilize the same theme while working with individual student needs.

This is a list of activities. Again, this is the name of the literature piece being used in the Spanish Language Arts. It's Los Elefantes. The skills being reinforced, as well as the language skills, are counting and numbers.

When we go to the Language Develop Component, the same skills are being developed. As they develop their English language, they'll be using an English story that gives a separate literature piece that still builds on the same theme.

These units emphasize knowledge and experience. They are interactive. They develop language that are natural. They are not out of context. They are based on natural ways of speaking. And they all work together to build literacy.

The story we're going to look at very quickly is called Los Elefantes. As you can tell, it is not a computerized voice. It is a recorded voice that is easily understood.

The students would log onto their computers, and they would click on la hora de cuento which is story time. And, again, as well as language development, this is also used in their math activities.

The computer allows the students to choose whether the computer is going to read to them, it is going to read with them or let the student read on their own. It depends on the student's level of comfort at that point.

If they need the computer help, they will click on for the computer to read to them. If they are totally confident in reading it on their own, they will click on letting themselves read while the computer just puts the words up there.

At any point in the story, the students can repeat and have the computer read it over to them as many times as they need. And they can go back to the previous We're going to back out of the story and just show a list of the activities in addition to the stories. Again, all the activities come out of the context of the story. They're not being taught phonetic skills and isolation.

After they read the story, they go to a set of comprehensive questions which are interactive. The students don't just answer yes or no to a question. So it says, "How many elephants are in the spider's web? Mark the card with the number of how many elephants there are."

So, if they give the incorrect answer, instead of just saying no, it reinforces language. Again, this is a language development program. We are trying to develop language as well as the skills involved in the math. So it's telling them in their language, rather than just no, look carefully and count the elephants. Try again.

If they do not remember the story, they can go he answer. And, again, these comprehensive questions is not just a test if they know the answer or don't know the answer. It's developing their language, and it becomes a learning activity within itself.

That's just a sample of two of the activities on the computer. The computer is only one part or one component of the unit. There are many online activities in Spanish and English. There are games that directly tie into the unit.

One important aspect is the parent component. There is a newsletter that goes with every single unit that gives the parents information about what the student is learning, at-home activities that they could use to reinforce that skill, a bibliography of books if they take their student to the library and a summary of the stories so that they can talk to their students about that story.

This language arts program allows the teacher to implement technology based on the need of the student depending on their level of literacy. And it's a very important, I think, component of bilingual education.

Senator BINGAMAN. Thank you very much. That's a very interesting demonstration. Thank you.

Our final demonstration is the Academy of Communications, Arts and Technology at Santa Fe High. Consuelom, thank you for being here.

Ms. GONZALES. Thank you. I'm really excited for being invited. I think you'll enjoy listening to the students. I'm representing a team of four teachers that have developed ACAT, Academy of Communications, Arts and Technology.

Briefly, it's an interdisciplinary program that emphasizes student learning because it's student centered, and students produce or explore academics through their own production of communicating what they've learned.

It uses relearning techniques, a coalition of integral sizers which emphasizes the fact that less is smart and students use their minds well. And I think technology and production is a big part of that and actually emphasize and underline the things that are used in this reform.

Mainly, through technology then, academics are learned and explored. I think that's the main point. Before I turn you over to my students that will demonstrate some of the projects we do in class, I want to emphasize that they do publish printed material as well, that they broadcast and present. So the idea is that they plan it, and they share what they learn with others.

If I could mention a couple of things: What can technology do for the school? 60 percent of our students last year had lost credit in high school due to none attendance in at least one class. Last year our average attendance was 90 percent. And that—you know, with students we had coming in, that was quite impressive. The thing is that not only are they here on summer vacation, they're there nights and weekends because they really enjoy working with the technology and producing and communicating and expressing themselves with it in a creative way.

The other thing I'd like to mention is I think there's a real big gap between public schools and colleges right now. Two of my former students came to me this summer and said that they would never have gotten through the freshman year in college without the applied and availability of Communications Technology that they had experienced in my classroom before. So I think we need to address that gap as well.

It's not just for vocation and for the work force. Students also need this technology and experience for college. So I'm going to turn you over now to three students of mine, Justin, Frank and Cameron. And I hope you enjoy.

Mr. LATHROP. Technology addresses the individual learning styles and needs of different students and keeps them engaged. Technology multiples the way the students receive information and communicate ideas. Therefore, it increases success for all students regardless of their personal learning limitations.

For instance, in the case of dyslexic people, it's unfair to judge them based on their writing or reading ability. But, given technology, they have an arena to learn in by utilizing their creativity without restrictions.

Traditionally all students have been limited by restrictions and the difficulties of formal writing. While this is important, it also—the audio-visual realm gives them a format to express individual

knowledge and to use their mind creatively. As well as that, it also incorporates writing and reading skills.

Mr. COX. While in a traditional classroom, the traditional classroom offered me nothing but failure, and writing was taught to me as nothing but a disability.

I was bored and uninterested in anything other than my personal friends. But the introduction of technology in ACAT broadened my abilities, and I was able to become a productive student. If I had been unable to go into ACAT and would have had to remain in the traditional classroom, I would have dropped out of school for sure.

One example of technology keeping me interested in school is a documentary that you will now see excerpts from. It was on American Indians. I found that I learned more by doing something than actually reading or writing. And I also learned—I did use reading and writing extensively.

I learned that students don't all learn the same. Some learn by reading, writing, using their hands, seeing how things work. And computers utilize all of these different skills and creates an activity in which students can learn in a way best suited for them in their different learning styles.

Mr. LATHROP. My experience in using technology as a learning tool comes from broadcast production as well as doing documentaries for the class.

And in the ACAT we have used communications also as part of our community service program. And, for example, I'm currently working on a promotional video for Big Brothers, Big Sisters in Santa Fe. And we also, as Ms. G mentioned, use technology to do some desktop publishing. 11 teenagers in Santa Fe.

Some people in the program have also worked on public service announcements on a variety of topics. Cameron is going to show you one now that we did on drinking and driving. (Video tape shown.)

Ms. GONZALES. Technology is great for problem solving skills because it never works right the first time.

Mr. LATHROP. This is one example of a public service announcement. In my work with communication and technology——

Senator BINGAMAN. Did you run that public service announcement on any of the TV channels?

Ms. GONZALES. Channel 13 showed it in one of their teenage productions. It was Teens and Drinking last fall. It's shown on national TV, but we don't get to see it because I think it's between 2:00 and 4:00 in the morning.

Senator BINGAMAN. I'll start watching for it. I'm usually up at those hours.

Mr. LATHROP. Also, in my experience with communication technology, I have discovered that it incorporates traditional aspects of learning as well such as reading and writing. But it also provides a creative outlet for expressing my ideas and what I feel about things.

In fact, in my video projects, I've had to do a lot more reading and writing and thinking than I've ever had to do in my regular classes.

For example, in a journalistic broadcast piece I did—it was in News 101—it was on dropouts and the experience, the comprehensive evaluation of schools as well as my own education. Cameron's going to go show an excerpt from that now. (Video tape shown.)

Mr. COX. Technology expands the classroom itself to include the outside world, a multidimensional multimedia which our students already live in and need to understand.

Students are brought up in a complex world where they are introduced to people and influenced by people, television and music. And, in a traditional classroom, they are not taught to analyze and critically think about the effect of these things on our lives. This is a big mistake.

Because students are not taught to critically analyze what they see, hear or read, they may get the impression that everything portrayed in the media is acceptable.

For example, the media portrayal of women furthers the notion that they are nothing but sex objects and pets. Children see images on MTV of half naked women chained or in cages. They may come to think of this as normal and acceptable.

Mr. LATHROP. The media also tells us what we need. We are manipulated into believing that we will never be happy unless we use Scope mouthwash, wear Michael Jordan basketball shoes and drink Diet Pepsi. More importantly, the media has the power to control who we vote for in the elections because almost all the information that we get about candidates comes from the media.

Applied communications technology in the classroom gives us the tools to counteract the media influence and understand how it works and empowers us to use it for our own expression.

Also the ACAT program is a part of New Mexico Media Literacy Project. So this, what we've been talking about the last couple of minutes, is part of media literacy. It is extremely important for people to understand what they're seeing on TV. Frank.

Mr. COX. Our third point we wanted to make is that technology is fundamental in our society and, therefore, must be fundamental in our schools. Computers already surround almost every aspect of our lives, and there are new uses for it every day.

Already some technological fluency is needed to use even your coffee maker or stereo. Most six-year olds can operate their VCRs much beyond the ability of their parents. In the world today they are naturally exposed to these type of technologies. But wouldn't it be wonderful if the school could take the natural ability of a 6 year old that exceeds the parent's understanding of technology and broaden it to his knowledge of the world around him.

Mr. LATHROP. The 21st century of computer and technological fluency is going to be as important a skill to have as reading or math.

As well as being increasingly important in our every day existence, computers are also becoming essential to participate in every aspect of our economy. Everyone from delivery people to car mechanics to doctors and lawyers must be comfortable working with computers just to do their jobs.

For our children to compete in the world of the future, they must be technologically literate. And this will only be accomplished through the schools.

In the democratic society, knowledge is power. In today's world, so much knowledge and power is tied up in communication technology. If we wish to remain truly democratic, everyone needs to have equal access to it.

Ms. GONZALES. Aren't they great?

Senator BINGAMAN. They are great.

Ms. GONZALES. I think that I would like to close by addressing an important question at this point which is where did ACAT get the technology that we have? We begged and we borrowed.

For example, Cameron is going to show you some visuals right now, while I keep talking, about an experience that we were able to have last spring called the Electronic Cafe.

Basically it's what's going to happen with everyone in the next year or two which is being able to send visual images through the telephone lines. And this particularly is what we were using, even cellular phones.

We were connected to the Community College people in Albuquerque, and we were communicating from Santa Fe to Albuquerque instantaneously through telephone lines. It was really an exciting event.

Where did we get the technology? Well, the Community College loaned us their stuff. Sprint Cellular loaned us their cellular phones. And Public Access helped us with cables and lines.

It was a great event. After the event was over, all the technology was packed up and is now no longer at school which is the way a lot of things happen.

As far as begging for a lot of technology, we've written grants on our own and so on. Our school system cannot support the expense of technology. And all the technology that ACAT has attained we've gained it little by little over the last 4 years.

The first 2 years the students did all of their own fund raising and actually bought their first computers from pizza sales, candy sales and car washes. The next year we were able to get some private businesses to help us through donations.

Then, the third year we were really fortunate because of what we had already done to get the attention of, you know, some other people in terms of grant writing, and we were given a one-time-only offer from Carl Perkins and were given enough of a grant to get some start up technology. But now that grant is gone.

And what it did do is it made it available to us to expand our program from 30 students to 100 and actually put together the ACAT program.

Cameron, are you going to show, at this time, some of the things you can do with a video toaster? Do you want to go ahead and do that, and I'll keep talking since we're kind of pressed for time.

You can get a multimedia display here. I'll keep talking at you, and Cameron will show you some tricks with the computer here that he has learned.

One thing I'd like to say about Cameron is that this is his third year in my class. We call him our high-tech genius. Everything that he has learned he's learned hands on by himself.

And I'll be the first to say that my students know more than I do. Probably in a period of about 2 months, if you give them the

technology, they exceed the teacher's knowledge that fast. It's just amazing.

Also I'd like to say that one of the other things that we're really lucky about in ACAT is that we do have the support of the community. And I would like to say that businesses and corporations are extremely receptive to helping as much as they can, although the recession certainly made that not so much a monetary kind of help. But they're always there to help as much as they possible can. Little by little we hope to be able to have enough work stations for all of our students in ACAT and even increase our productivity.

And I think the community service aspect of our program—one of the other things that we have students do is they go into elementary schools and they help elementary school students do their own videos. And they do a lot of community service with younger students.

And I think, as feelings and generosity in helping one another expand more and more in the schools, that technology gives us a great access and great way to be able to do those things.

I'd like to thank you for sponsoring Senate Bill 1040, Mr. Bingaman. I think it shows that you are committed to education and to our youth. And I wish you luck. Anything we can do for you, let us know.

Senator BINGAMAN. OK. Well, thank you very much for the demonstration and the information. I appreciate it very much.

Let me ask one or two questions, and then the hearing will end because we're way over time.

How many students do you have at Santa Fe High that are now participating in your program?

Ms. GONZALES. We have 100 students full time and another 20 part time.

Senator BINGAMAN. When you say full time, what do you mean by that?

Ms. GONZALES. A four-hour block. They receive the credits of English, History, Social Science, Science, Communication and Communication Technology Lab.

Senator BINGAMAN. So they get credit for all of those courses, but they learn that material through use and technology?

Ms. GONZALES. Yes, sir.

Senator BINGAMAN. Is yours the only program like that in the State as far as you know?

Ms. GONZALES. Yes, it is. I would like to announce though that it looks like we're expanding across the Nation. I presented ACAT and how it uses communication technology to teach academics at Harvard University 2 weeks ago.

Because of that presentation, I have one school system in New Jersey that has already gotten approval to start ACAT. I have another—There's another school system in California that just needs some final okays from their school board, and they want to have an ACAT.

And there are four other schools that the teacher groups were there and taking it back to their districts to try to be able to begin an ACAT too. So we're going nationwide. And we're also hoping in New Mexico and certainly within our own school that we could expand.

Technology is, of course, a limitation that a lot of schools have to be able to just pick up this idea and run with it. Like I said, it took 4 years of hundreds of hours of volunteer work and volunteer time for us to be able to gain access to the technology that we have right now. And that's kind of intimidating for most people.

Senator BINGAMAN. Do the 100 students that you have in there—are those all the students that wanted to participate or are there others that would be part of this if you could handle more?

Ms. GONZALES. I'm sorry to say that there is a waiting list to be enrolled in ACAT. It is a heterogenous program, so there is no criteria. In other words, students who have failed in school before can still be part of the program, as well as straight A students. And our criteria is mainly random. And once we get to a point where we have a balance, a heterogenous group of students who are reflective of our schools—a certain number of students that aren't successful, a certain number that are, an ethnic balance and also an age balance—then we revert to a lottery system, and we draw names out of a hat because we want it to be random.

But, yes, we have a waiting list of students that would like to enter the program, but we don't have the technology to do that. It would be easy with the technology. We could just put together another team of teachers.

Senator BINGAMAN. Let me thank all three of the demonstration groups here. I think it's all been very useful. It show that there are some exciting things going on with the use of technology in our State.

I think the first panel was also very good showing that there are some innovative programs, a variety of programs, Distance Learning, use of computers in the home, a variety of things that are encouraging.

We thought this was the right time to have this hearing because it is the first week of school for much of the public school system in New Mexico. And I know that even the schools that haven't started yet are about to start.

But I do think that progress in this area is going to be similar to progress in any other area in that it's going to be incremental. There may be some significant steps we can take, and I hope that our Legislation turns out to be one of those to sort of move us down the road a significant distance.

And I hope also that we can work with the State to expand the use of technology very substantially here in New Mexico. I think we're positioned to do better in this area than virtually any other State. We just need to get our act together. I think many of you are already doing that in individual schools, individual school districts. We need to try to do it in a more comprehensive way throughout the State.

But, again, let me thank you all. And we will conclude the hearing with that. If there are people in the audience who have statements that they would like to submit to be part of the record, if they would get those to my office, we'd be glad to include those.

[Additional material submitted for the record follows:]

ADDITIONAL MATERIAL

PREPARED STATEMENT OF MARGARET EVANS GAYLE

This "Technology for Education Act of 1993" is the most important strategy, yet presented, to help America reach the National Goals by providing all learners and educators with equal access to up-to-date curriculum and media resources. This bill, coupled with Senate Bill 626, "Electronic Library Act of 1993," are both critical to addressing the access and equity issues for learning for all American citizens. Federal leadership and funding are essential to providing America's schools with the basic modern literacy tools. Both of these bills address a comprehensive approach to the technology infrastructure with requirements for collaborative efforts among education, business, and government. But, I have concerns that neither of the bills are focused on the major problems in providing equal access to all learners. Major problems related to access include: 1) non-existent telephone access in classrooms and libraries; 2) the lack of an inexpensive user-friendly standard "human interface" (such as the Nintendo interface) that will run on all hardware platforms; 3) old schools and public library facilities that will require major re-wiring; 4) existing rules, regulations, and funds that prohibit easy access to excellent educational materials that already exist (such as America on Line) and equipment (such as modems, CD Rom, and VCR's) and 5) existing local and state plans that have little funding for implementation of quality multimedia and hardware now or for the future.

I believe that the most important role for federal leadership is to focus, like a laser, on the design and development of—icon-driven "human interface" that is as easy to use as a Nintendo game and to fund research and practices only for programs that promote the national goals and standards. Training in technology and the design and development of quality curriculum and multimedia materials are both critical to moving American schools into the 21st century, but the most important issue to access and equity is to focus on a standard "interface." Local education agencies, universities, libraries, and the private sector do not need more top-down commissions, committees, and regulations to inhibit progress toward building this infrastructure. They need motivation to go forward.

Participants at the recent National Academy of Sciences Convocation, held May 12-14, 1993, agree that we should focus our energies and collaborations on delivering access, as rapidly as possible, to all communities and schools. Furthermore, they believe that we must find that "interface" that will provide all citizens with the opportunities to network and access information. If INTERNET becomes the standard, the "common people" will never use it because of the difficulty of the technology. So it is important that the research focus on an interface for INTERNET and other networks that is as easy to use as an ATM machine.

Despite reports to the contrary, the private sector, not the government will build and operate the new national information infrastructure. Telephone companies and cable television operators, not the government, will deliver access into America's homes to interactive entertainment, home shopping, and ultimately, they will provide more comprehensive educational initiatives.

The first hybrid networks, using fiber optic cable, existing copper wire and coaxial cable are being constructed now. The telephone, cable, computer, and other outside suppliers are in a mad scramble to team up and build these alliances for the home market. While all of these efforts are underway, there seems to be inertia in getting schools to use current technologies, much less plan for emerging technologies. Children, in the meantime, are demanding more and buying more individual, interactive video games.

We are approaching a new century in which we will turn away from MASS EDUCATION to an INDIVIDUALIZED LEARNING PROCESS which will be driven by the student's own curiosity and learning needs. The individual learning process will enable every person to build the skills essential to becoming a life-long learner. Every child in America should have identical access to learning resources. regardless of diversity of culture and ability, even in the poor urban or remote rural areas. The social implications are profound as we consider the potential of finally being able to provide equal access to quality public education for all of our citizens, as promised by the Constitution.

John Dewey, nearly a hundred years ago, stated that in a democracy: "Every student should learn to be his or her own scientist; that they have their own questions that need to be answered." (Robert Westbrook, John Dewey and American Democracy, Cornell Press, 1991)

In the past, education for the masses was tolerated because it was the only way we could reach the illiterate. Today, we can give individual learners the interactive tools to learn from many teachers and with a focus on individual needs. In today's

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classrooms, students compete for opportunities to learn; many of them lose in that competitive struggle with the Bell Curve. Today's textbook should become a laptop computer—given to every child, upon entering school, for use at school and at home. In the long run it would be cheaper, because the family would then have a learning machine at home. As television, computers, and the telephone become one interactive machine for delivering multimedia, we will be able to turn the home into a learning center with access for education and training programs for the entire family.

Adults could take literacy and workforce preparedness programs on the same machine. We continue to lose ground on adult literacy in this country, for the same reasons that we are not making progress in the public schools. Changes in the global economy, society, work, and family have put most of the burden on public schools for education and training. Public schools and the university training programs for educational professionals are not able to catch up, much less keep up with the technology and current resources. Most training programs for professional educators are obsolete in the curriculum and technology areas. While many of our teachers are behind, our students are ahead in the use of technology.

JUST THE FACTS: THE NINTENDO GENERATION

It is difficult to comprehend that most kids in their homes today have more technology for entertainment, than they do for education in schools. Consider this, children own 114.2 million Nintendo hardware systems: in America, 33% of the households; and in Japan, 40% of the households.

In 1992, Nintendo sold 170 million cartridges for Nintendo worldwide, at an average cost of $40.00 a cartridge or for a total of $7 Billion. In 1992, America's children spent $4.7 billion (the biggest year yet) on Super Nintendo. American revenues alone for Super Mario Brothers 3 were $500 Million. As a company, in addition, in 1991, Nintendo earned $1.5 million per employee. George Sheffs new book, Game Over: How Nintendo Zapped an American Industry, Captured Your Dollars, and Enslaved Your Children, published by Random House, 1993, describes this incredible state of video games and the success of a century old company to understand what engages children and to focus on selling them what they want. Why are we so ignorant about delivering this kind of technology to the schools? There are other indications of America's obsession with technology driven products and for interaction with multimedia: $4 Billion spent on video games; $12 Billion spent on video rentals; $65 Billion spent on residential phone service; and $70 Billion spent on television catalog shopping.

Forecasters predict a $3.5 Trillion worldwide interactive information industry by the year 2001, and video on demand with the potential for 500 channels to be here within the next few years. The time is now to set our priorities for bringing schools into the 20th Century, maybe just in time for the 21st Century. We must focus our energy on providing equal access to all learners, by using existing quality resources, while building future networks and interactive multimedia programs.

TECHNOLOGY PRIORITIES FOR PUBLIC AND PRIVATE SCHOOLS—K-12

As indicated above, children have access to more computers than any other population; Nintendo computers that entertain them and teach them problem solving skills at home, but not in the schools. From the 80's decade of the Pac-Man Generation to the present Nintendo Generation, children have created their own game education culture. Children buy video game magazines to find the hidden resources in the games; call their friends to check on clues; and challenge their own potential to move to higher levels within the games. Consider the potential of providing the same in-expensive, easy-to-use interface for computers in schools, cartridges with provocative curriculum, surrounded by relevant learning resources. This is the challenge for leadership by local, state, and federal governments.

Federal and state leadership and funding are essential to providing America's schools with the basic modern literacy tools. But, I have concerns that few of the efforts are focused on the major problems of providing equal access to all learners. Major problems related to access include: 1) lack of knowledge, by teachers, about how to use technology in classrooms; 2) non-existent telephone access in classrooms and libraries; 3) the lack of an inexpensive user-friendly standard "human interface" (such as the Nintendo interface) that will run on all hardware platforms; 4) old schools and public library facilities that will require major re-wiring; 5) existing rules and regulations that prohibit easy access in-expensive, excellent educational materials that already exist (such as America on Line) and equipment, such as modems, CD Rom, and VCR's; and 6) existing local and state plans that have no funding for implementation or priorities of training for teachers.

PRIORITIES that I believe should include:

1) mass education of teachers, parents, and students of existing quality programs; a. media resources and the potential of outstanding new programs and services, including those listed below; b. training on user-friendly machines for access to media resources—focused on teaching electronic access; and c. national clearinghouse for current resources and technologies,

2) development of a strategic technology plan for every school and district; and

3) Media Centers with on-line services to the outstanding resources: a. America On Line, Services for students, teachers, parents that include: Turner Educational Curriculum & Resources; National Geographic Curriculum & Resources; Smithsonian Educational Resources; NEA Daily Report Card and other studies and reports; all major education journals; teacher and parent bulletin boards; and access to INTERNET & OTHER ON-LINE Services, b. Add CDRom and Video Libraries, as they are developed, for use by all students and teachers, and c. Mass Media Literacy and Media Production Skills for all students.

4) Cable/Satellite Access—utilization of outstanding public and cable programs; a. Public Television Stations Educational Programming, b. Cable In The Classroom, c. The Learning Channel, d. The Discovery Channel, and e. Turner Education—CNN.

5) Computers—(old and new) for teaching K-12 writing and research skills; a. word processing, b. using on-line databases for research and problem solving, c. Desktop Publishing for every classroom—one computer is great!

6) Computer Assisted Instruction—as funds become available; a. Josten's Learning Systems, b. Broderbund Programs, c. The Learning Company, d. CAD and Other Vocational Programs, e. Access to INTERNET—Exceptional for the Science & Technology

(7) Telephones for Communication and Teleconferencing; a. Central site within a school, b. For Classrooms, as funds become available, c. Use for Guest Experts, Voice Mail to Parents, and d. Distance Learning Access when combined with Cable/Satellite.

SUMMARY AND CONCLUSIONS

The public debate must center around the need to use existing technology to provide teachers and students with the resources they need to keep their curriculum up to date. The reform efforts, for the past decade, have done little to motivate parents, teachers, and students to perform at high levels. The system has to be energized with the modern tools of an information society.

Chris Whittle is now in doubt that he will be able to start-up some schools under his Edison Project, but even if he does, his efforts will never provide free access to the masses. The New American Schools Development Corporation has not been able to fulfill the promises of implementing "break the mold designs;" the process was too conventional, too limited to be successful, and they were unable to raise the funds necessary for real innovation.

Many states such as North Carolina, Georgia, Texas, and others are trying to build alliances for putting technology into the schools. These efforts underway are getting much publicity for the technology companies, universities, and people involved, but if we do not build this infrastructure to support the national goals, quality curriculum, and access for all learners and their teachers, we will have failed again in our efforts to improve public education dramatically.

We continue to debate spending more time in school and many districts are extending the school year. But isn't it ironic that we still have a majority of schools that are not air conditioned and students are sent home by noon to avoid the afternoon temperatures; temperatures that are not good for children nor for computers. When all is said and done, we continue to make more laws, to spend more money, and to build plans that somehow never reach the majority of students or teachers. In a country as rich as America, we should be able to give every student in America a portable laptop computer with access to appropriate curriculum and resources. We should give it to them in lieu of textbooks. It should be theirs to keep. We should be able to do it today; tomorrow will be too late.

NATIONAL ACADEMY OF SCIENCES,
WASHINGTON, D.C. 20418,
June 4, 1993.

Ms. Margaret Evans Gayle,
President,
Triangle Management Group,
3700 Pembrook Place,
Raleigh, NC 27612.

DEAR MARGARET: I am writing to thank you for your participation in our May 10-12 convocation, "Reinventing Schools: The Technology is Now." The event appears to have been an intellectual, organizational, and technological success and was in the end, I think, more than we even hoped it would be. We brought under one roof groups which should have much more dialogue about the future of information technology and education—students; game software makers; public officials; teachers and educators; venture capitalists; those concerned with government and private sector extension of the networks; those concerned with equity for minorities; and reporters eager to learn more about education as well as technology.

Perhaps the most encouraging result of mixing the diverse groups at the convocation was that consensus emerged on several main themes: the technology is here and mare accessible than many in the educational system think; increasingly, this fact is appreciated by the young; interactive learning can and should extend good teacher-motivated classroom experience; it can promote learning while celebrating the diversity of students, allowing them to advance at their own paces; the extensive access that information technology provides can be very rewarding when coupled with hands-on science; and, the teacher can and should play a large role in bringing the outside and inside classroom worlds together. The value of having software with content tied to the existing and emergent curriculum standards came out clearly, as did the importance of reconceptualizing learning and school. Finally, we feel that the convocation shed some light on one of today's important policy issues: ensuring that the private and government roles in network development take into account fully the urgent need to extend network access as rapidly as possible into all communities and schools.

Your contribution was important in making the event a success. Your remarks addressed one of the key points of the convocation, that the children of today are a different audience and that our national and local efforts have to realize that and adapt. You were one of the most persuasive speakers in the entire two and one-half day convocation. Having Joseph Smarr and his Nintendo as a backdrop was an ingenious exclamation point to your message.

We hope that every speaker, every panelist, and every attendee is asking the bane question we are asking ourselves: What do all of us in our respective spheres do next? From the beginning of this effort I have said we would have to see about the Academy's future role. It may be a restricted role, allowing others to carry on the crusade. Or a more sizable role may emerge from the feedback we get over the next few months. My successor, Bruce Alberts, will have to wrestle with this when he becomes President, July 1.

Our immediate objective is to create the products of the convocation. We plan to transform what we displayed, saw, and heard into an attractive report, a video, and a CD-ROM, and to get these out across the country to teachers, administrators, government officials at various levels, and industry leaders. The first wave of materials should be ready in the autumn; you will receive these as they are available. In the meantime, we will send to you a final list of attendees at the convocation.

Once again, my sincere appreciation for your contribution to "Reinventing Schools: The Technology is Now."

Yours sincerely,

FRANK PRESS,
President.

PREPARED STATEMENT OF KATHRYN HARRIS TIJERINA

Senator Bingaman and members of the Senate Committee on Labor and Human Resources, my name is Kathryn Harris Tijerina and I am an enrolled member of the Comanche Tribe. I am submitting written testimony to you as the President of the Institute of American Indian and Alaska Native Culture and Arts Development, known to most as the Institute of American Indian Arts (IAIA).

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IAIA supports your commitment to creating a technologically literate citizenry and an internationally competitive work force demonstrated through this bill. I affirm the bill's purposes:

> to establish a comprehensive system through which appropriate technology-enhanced curriculum, instruction, and administrative support resources and services are provided to schools throughout the United States;
>
> to establish this system in a way that supports the National Education Goals and any national educational standards that may be developed.

In principle, the provisions of this bill are timely and most important to American Indian and Alaska Native students and educators as well as the mainstream populations toward whom the bill is directed.

Two of the bill's stated objectives "to promote greater equality of educational opportunity and instruction among school districts through the use of technology to improve the academic achievements of all students, in general, and disadvantaged, disabled, and limited-English proficient students, in particular and to improve educational equality and opportunity by expanding and improving technology in the school, classroom, library, and home," are specifically relevant to the Institute. The Institute has resources in place to assist in implementing these goals in American Indian and Alaska Native communities. One of these resources is the National Center for the Production of Native Images (Native Images), whose mission is to prepare emerging American Indian and Alaska Native film producers to tell their creative stories in their own ways. The Center is the only national video training and production center in the country managed by American Indians. Dedicated to providing technical support, training and programming about and for American Indians and Alaska Natives, Native Images has a track record that has set a precedent in working within these communities in the area of video and graphics.

Another of these resources is the Computer Services Department whose mandate is the application of information technology to create opportunities to enrich instructional curriculum, to deliver student services, to manage the organization and to provide access to programs and resources for the diverse clientele of the Institute.

Thus, I want to recommend that language be added to the bill creating a set-aside for the American Indian and Alaska Native communities and colleges. Such a set-aside should specify the Institute. IAIA has connections to more than 80 tribes through our student body and faculty networks. Establishing the Institute as an important element of the set-aside will capitalize on the knowledge of American Indian and Alaska Native cultural norms and values that are critical in achieving successful implementation of the bill's provision for Indian students.

The Institute also is an active member of the American Indian Higher Education Consortium, a group including 27 tribal colleges. In addition, the Institute has established several centers that can provide professional expertise with developing specific programs to address the needs outlined in the bill.

First, the Institute can provide technical support and staff development to American Indian and Alaska Native schools by disseminating information on current computer technology. For example, the Institute's access to computer networks such as IndianNet, NativeNet, National Indian Policy Research Institute (NIPRI) and the Educational Native American Network (ENAN), provides a direct link to undergraduate and graduate students on numerous campuses nationwide. These networks have been designed to enhance the educational environment for American Indian and Alaska Native students by:

> supporting, expanding and improving the delivery of innovative technological programs in the rural, geographically dispersed schools; and
>
> promoting the basic "computer literacy" of administrators, teachers and students, especially in the use of computers as telecommunication tools.

Second, the Institute also can provide facilities for classroom video production and teleconferencing capabilities. The Institute's National Center for the Production of Native Images already is working with various tribal communities to enhance the use of video technology in American Indian and Alaska Native communities by providing training. These relationships can be expanded and the Institute is capable of coordinating a collaborative effort in curriculum development that would be useful to educators in all Native communities. The National Center for the Production of Native Images currently is working to develop curriculum resources to accompany its Peabody award-winning production, "Surviving Columbus." The Institute's Center for Research and Cultural Exchange also has experience in curriculum development and outreach to schools and various tribes across the country based on information it has gathered regarding Indian aesthetics and cultural values.

Third, the Institute can help to bring about a nationwide discussion for American Indians and Alaska Natives regarding uses and applications of various types of technology. This discussion will include advocating for the concept of working with manufacturers to promote standards to guide the development of compatible hardware and software so that educational resources will be functionally transferable between American Indian and Alaska Native communities and nationwide educational communities. The Institute's role as coordinator of technology-enhanced, educational resources will be to insure that technological development within the tribes is moving toward effective utilization of computer and video technology that is reflective of nationwide communication and computer architecture standards.

Finally, all of us at the Institute greatly appreciate the support you have provided to us through the years. Your support has helped us move toward the establishment of an autonomous campus that will be a demonstration site for many aspects of higher education. We would like to return some of what we have been given by providing support to Indian Country as outlined here.

Thank you for this opportunity to share our views on this legislation.

Senator BINGAMAN. If any of you have ideas or comments or suggestions for changes in our Legislation, we would be interested to hear that as well. So, again, thank you very much for attending. And thank all of you who worked hard to get this put together. The hearing is concluded.

[Whereupon, the committee was adjourned.]

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